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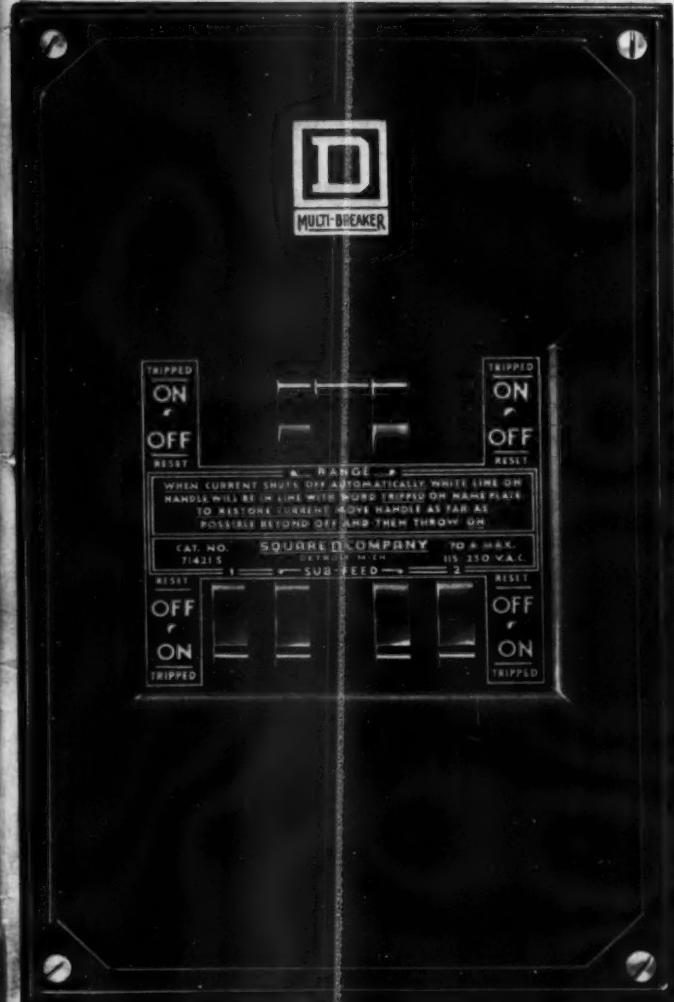
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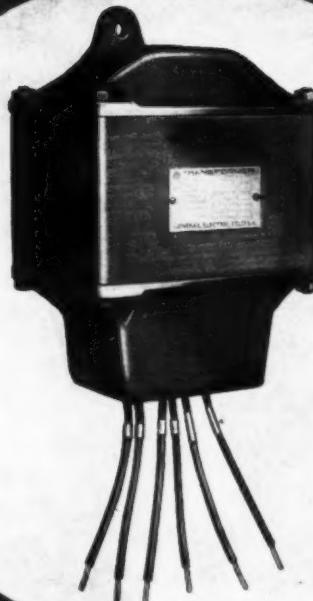
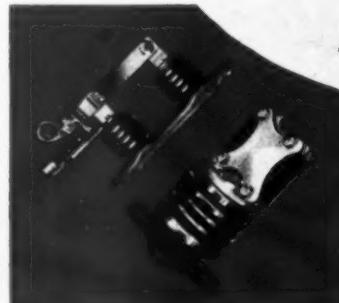
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The Electragist and Electrical Record

Vol. 35

September, 1936

No. 11

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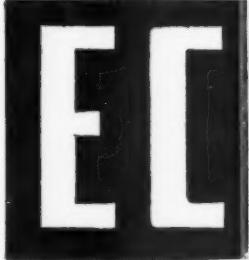
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Electrical Contracting, September 1936



SEPTEMBER

1936

Preparation

READERS, being human, are apt to take for granted that which comes to them regularly. In fact, it often happens that having been so long accustomed to receiving a full service they cease to appreciate all that the magazine is doing for them. An analysis, therefore, of the preparation of an ordinary issue of ELECTRICAL CONTRACTING might help our readers find added values which they had been missing.

IN the first place the text of this magazine is divided into fourteen separate classifications, each one of which has to be covered in the compilation of an issue. Not only that but in each classification a balance of interest must be maintained. It would not do, for instance, in the Service Shop Practice department to have only articles on shop tools. There are other things such as winding methods, shop layout, stock keeping, testing, management, etc., which must be given consideration.

TO provide this balance and multiplicity of interest requires endless search. For the average issue nearly fifty shops or jobs are visited by a trained editor. This is worth much more to the reader than if he had personally visited the fifty shops because the editor in the field culls out all but the worth-while data. And then when he does find something, he photographs it so that the reader can see it for himself. That means nearly fifty photographs for the average issue.

In addition to the above, there are forty or fifty other personal contacts. And then, just by way of keeping in touch with things, there are many times that number of letters and telephone calls. So that by the time an issue is made up hundreds of people have been involved.

TO make these contacts, representatives of ELECTRICAL CONTRACTING will have visited all but fourteen of the States during the first eight months of this year. Thus there is diversification by classification of information, by subject matter under each classification and finally by geographical location.

BECAUSE of this careful attention to widespread interest, there is no issue of ELECTRICAL CONTRACTING that does not contain at least one piece of information for every reader that alone is worth more than the price of the subscription.

Memorandum

*Develop your Industrial Business
by checking these points...*



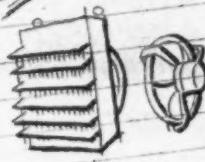
1. Install better lighting. Increases production per man. Call Graybar for advice; complete line of fixtures and glassware.



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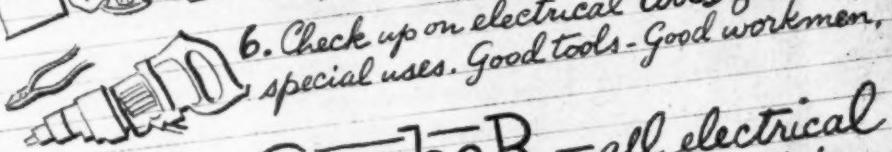
3. Revise wiring layouts to meet changed production conditions. Replace makeshifts with dependable, lasting equipment.



4. Make simple improvements in ventilation with fans, unit heaters. Ask Graybar for suggestions.



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6. Check up on electrical tools for special uses. Good tools - Good workmen.

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ELECTRICAL CONTRACTING

Vol. 35 SEPTEMBER, 1936 No. 11

▲
S. B. Williams, Editor
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FIELD BRIEFS

● ONE OF THE LARGE chain store organizations of the southwestern states has all of its larger panelboards designed to include a separate compartment with a hinged door for storing spare fuses to match the circuits of that panel.

● APPROXIMATELY \$60,000 worth of new business in wiring, wiring materials and appliances has been created in Milwaukee, Wis., according to a League report, since the first of the year through 80 Red Seal wiring installations.

● AN OUTGROWTH of rural electrification recently came to light in Minnesota, where it is reported that a mail-order organization canvasses wiring contracts, sells the materials to the farmer, and sublets the labor to local fellows. It is said the successful installer receives a 10 per cent commission on the materials.

● CONTRACTORS of Minneapolis, Minn., are permitted to install the service raceway complete with con-

ductors and meter terminal cabinet during the roughing-in operations of residences, although the branch circuit conductors may not be installed until plastering is finished. This ruling allows temporary use of the service when it is needed for floor surfacing machines or other motorized construction equipment.

● SELECT YOUR OWN most comfortable light, press a button and get a card giving the number of foot-candles you selected—all done by the new G.E. light selector recorder, a new light selling tool developed at Nela Park.

● INSTALLATION RULES of Oklahoma City, Okla., require the use of electrical metallic tubing or rigid iron conduit in all residences. On outside walls the runs between outlets must not be looped to the floor unless a junction box drain is provided at the cellar ceiling. The roughed in job is left exposed and inspected after the wire has been pulled.

● A COMMON COMPLAINT is voiced against contractor-dealers by power company engineers who are promoting Better Light—Better Sight in the southwestern states. It is claimed the old left-over stocks of bare-lamp fixtures are permitted to block the chance of selling modern shaded-lamp units. Rather than put them out of sight, they are permitted to remain on display, thus hindering the chance of making a sale.

● A BUSINESS which might be called a child of the depression is the making of a.c. generators out of old wound rotor motors. Several motor service shops in Oklahoma City and Tulsa have been building this equipment for several years to supply a steady demand for generators of from 15 to 50 k.w. One firm reports having built 245 such units for theatres, large stores and industries that are now operating isolated plants. Large automobile or truck engines are used as prime movers. These engines are equipped with carburetors for consuming the cheap natural gas in that state.



The 110-ft. steel towers usually have sixteen vaporproof lighting outlets spaced equally to the top, and run in one inside corner. Rigid conduit is made up to threaded fittings and hoisted in place in 30 to 40 ft. made up sections. After a well is completed, permanent explosion-proof outlets are installed.

AMONG the maze of steel oil well towers that are scattered throughout the northeastern section of Oklahoma City's residence district are many oil gushers and heavy producing gas wells that were drilled with electrically driven equipment. Wiring is being provided for this equipment to provide maximum safety, yet to provide a salvageable and moveable layout, because it takes only from 30 to 60 days to bring in a well of 6,000 to 7,000 ft. depth.

All installations are made under the city electrical inspection department's requirements, an inspection permit being required for each set-up at a new location. Because the machinery is located in the back yards of homes, or on vacant property close by, the first objective is that of safety to homes and their occupants against fires, explosions and shocks. Accordingly all the lighting equipment is originally made vaporproof. After a well is brought in, the steel tower which remains must be provided with explosion-proof outlets. A completed well repre-

Oil Well

Wiring Practice

resents an investment of \$80,000 or more that must be safeguarded as well as the neighborhood.

On engine driven outfits there are only the lights to be inspected. However, many wells are drilled with motors operated from purchased power through local transformer stations, or they are drilled by motors that are supplied from large gas engine generators. All motor-equipped outfits utilize a flexible feeder cable system designed to permit its re-use at minimum installation expense on the next job. It is therefore necessary for the inspector to make careful examinations of old materials to weed out those which have become unsafe because of mechanical or other injuries.

For its drilling and hoisting equipment this well employed two 125 hp., 440-v. a.c. motors on a dual-drive draw works unit. Oil-immersed magnetic switches appear in the background together with large resistor banks. All starting and control equipment is racked on heavy steel frames and skids. The head driller can adjust the motor speed at his station with a drum switch hand wheel and extension rod.



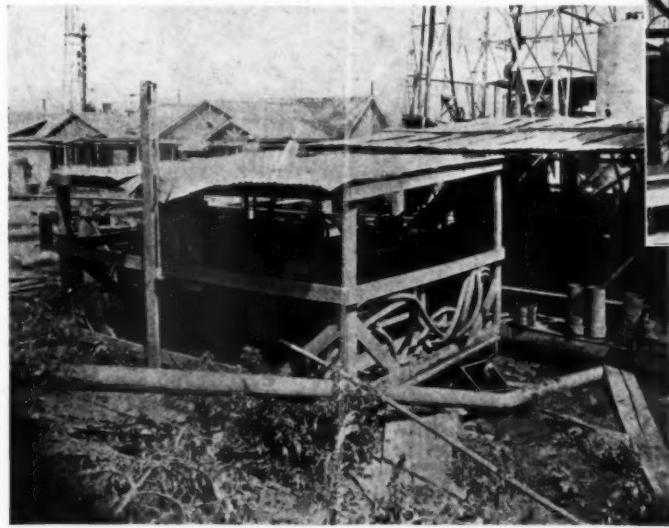
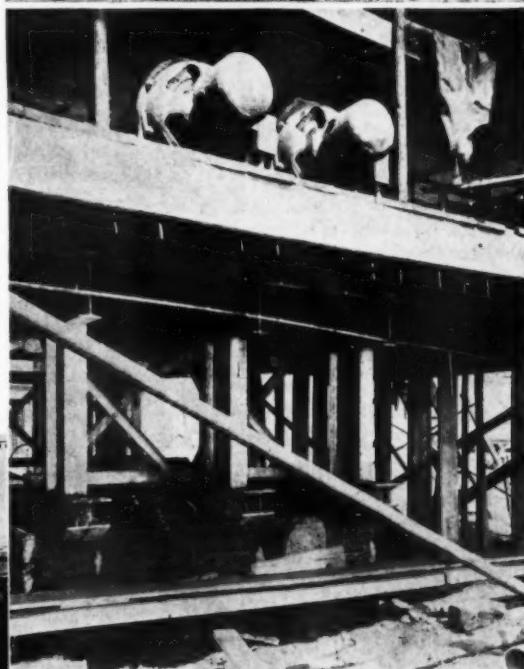
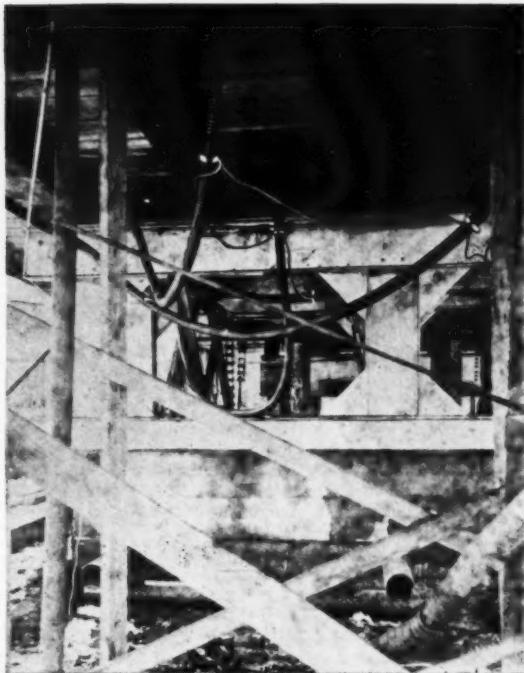
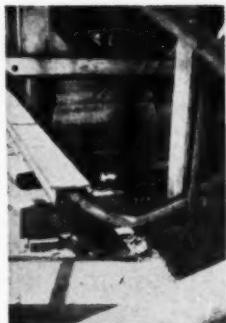
Electrically-operated outfits use one or two motors on the drilling platform, a duplicate set of "mud hogs" or sludge pumps, a fresh water pump, and on some outfits, a shale shaker motor. The lighting system comprises about twenty-five outlets on three circuits of No. 12 wire. Usually sixteen outlets are placed on the tower, the remainder being placed around the drill rig and sheds. All lighting outlets are installed in rigid iron conduit.

The main service and distribution equipment for the power wiring is usually assembled on one large rack that is integral with one of the skid-bottom controller and resistor units. After being placed in service there are no future interconnections to be made. Only the main connections from a transformer station are needed.

The accompanying views are of an installation that was made by the Capital Electric Company of Oklahoma City, and Owens Electric Company of Siminole and Oklahoma City, Okla.

With operations being conducted day and night, and with equipment being shifted quickly to cut down idle time there have been no serious cases of oil well fires or explosions in Oklahoma City attributable to electrical causes.

The two sludge pumps or "mud hogs" for this outfit each require a 200 hp. motor. The resistor banks are assembled with their control equipment on heavy angle iron skid-bottom racks. Because the pumping shed is never the same distance from the draw works platform, the extra long feeders are provided with the excess length coiled up beside the controller.

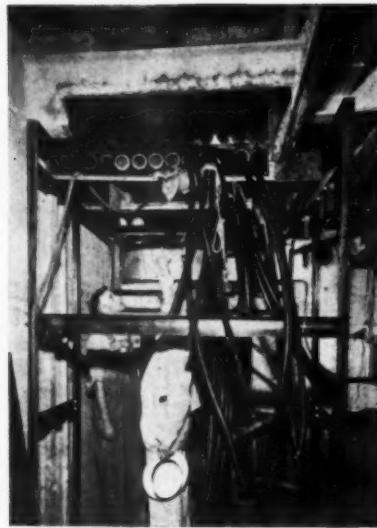


The machinery platforms extend away from the base of the steel tower and rest on heavy concrete foundations and structural steel. A handy height for making out-of-the-way wiring connections beneath the platform to heavy equipment. The horizontal wooden trough in the lower foreground contains a three-conductor feeder in flexible steel conduit that connects to the mud-hog motors 120 ft. away.

Chicago's Changeover Operations

A CHANEOVER program estimated to eventually total from three to five million dollars in electrical work within Chicago's Loop district, where existing d.c. services are being gradually revamped for 4-wire a.c. supply networks, has now been under way for the past eighteen months. To serve large structures more safely and adequately, this program is resulting in considerable modernization work while new feeders and service equipment of heavy capacity are being installed.

Contractors are doing these jobs under the supervision of special electrical inspectors who work full time on changeover projects with the power company engineering staff. New feeders and distribution equipment are generally required. Additional work must often be done



New a.c. services of large capacity must frequently be engineered to overcome existing space limitations. This store changeover required a new 5,000-amp. circuit breaker and eight sets of multiple feeders, each consisting of a 4-in. conduit enclosing three 750,000-c.m. and one 500,000-c.m. cable. City Inspector Daniels and Foreman Johnson, of Henry Newgard & Co., are checking some details of a 20-sq.ft., 30-in. deep junction box that was placed above the main service breaker panel that will be mounted on the 64-in. steel framework in the foreground as soon as cables have all been pulled.



Skill is required in planning feeder layouts that will not interfere with store arrangement, large ducts, etc. To route this bank of eight feeder conduits least conspicuously, a junction box had to be crowded in above some shelves. Here long feeder runs were pulled through a right angle turn without splices by means of a grooved idler pulley. This pulley was attached to the box ceiling on a 2½-in. steel spindle and a diagonal anchor of steel cable. The 176-ft. runs of cable were winched around this crowded turn in about 26 minutes each with a power drive winch attachment.

throughout various structures because of generally run-down or defective conditions that are being found by inspectors.

A general minimum requirement of 2 watts per square foot for light-

ing feeder capacity is being followed. Motors are checked as to present ratings and as to the sizes of new a.c. equipment that is to be installed in replacement. Each project is then worked out with the inspection department upon riser diagrams that indicate the existing feeder system. Some riser raceways are found suitable for use with new 4-wire feeder conductors, while in other installations additional capacity is necessary to provide the minimum floor area carrying capacities. The new 4-wire feeder systems are being color-coded at all terminals for permanent phase identification.



Large switchboards with 3-wire d.c. busses are being rearranged for new 4-wire a.c. feeder equipment without interruptions to service. This board is 40-ft. long, and has 17 panels. Here temporary fuse cutout racks were provided on the rear wall for the old d.c. system. New a.c. panels and busses will be installed on the framework and a system of new conductors and conduits is planned for the overhead junction box.

Apartment Range Wiring with Entrance Cable

WHEN Section 513 was put into the 1935 National Electrical Code permitting bare neutral service entrance cable to be used for interior wiring to electrical ranges, it is doubtful if any one thought much beyond its use in one or two family dwellings. Now, however, comes a large apartment hotel building in a change-over from gas to electric cooking wherein the entire range wiring job is done in three-conductor service entrance cable of the Anaconda style SCF.

In all 233 ranges rated at 6,900 watts and eight others of 8,500 watts, with a total connected load of 1,687-kw., were installed in the Longwood Towers, Brookline, Mass., the largest apartment hotel of its type in New England, by the Gaston Electric Company of Boston. The Boston Edison Company cooperated with the electrical contractor in making the electrical layout which involved a number of methods for simplifying the installation problem.

Vents for Raceways

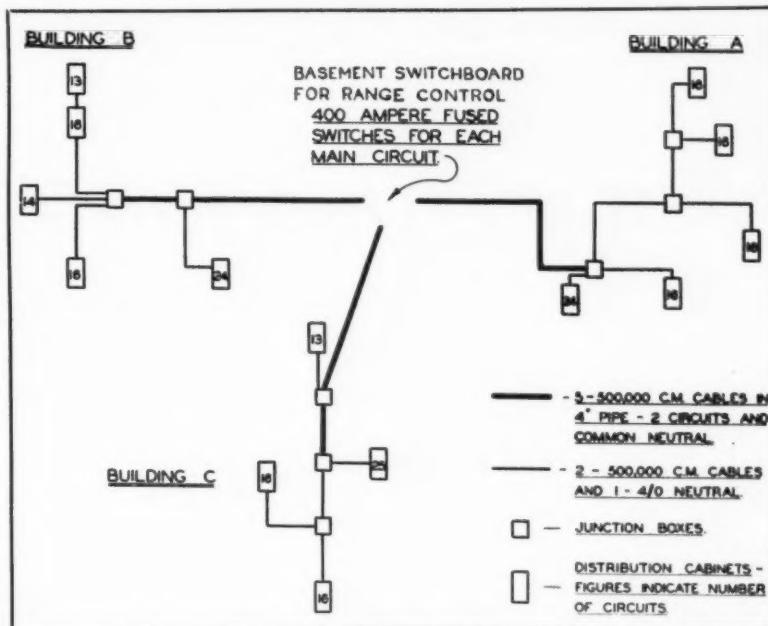
The vent pipes for the old gas ranges, 4 in. in diameter, were utilized as riser raceways for the range feeds. About 12,000 ft. of service entrance cable was used between the terminal boxes in the basements at the foot of these vent pipes and the range receptacles. When the change-over was at full speed, eight electric ranges were connected every other day, and the entire job was accomplished without a single complaint from a tenant. In fact, no one was obliged to interrupt the use of an apartment kitchen for more than three meals and in many cases the work was done with but one meal interrupted.

Two 75-kva. single-phase transformers supply the range service through a 2,000-amp. circuit breaker on a basement switchboard devoted solely to range control and metering. The service is single-phase with grounded neutral from the transformer secondaries to the range receptacles. A schematic diagram

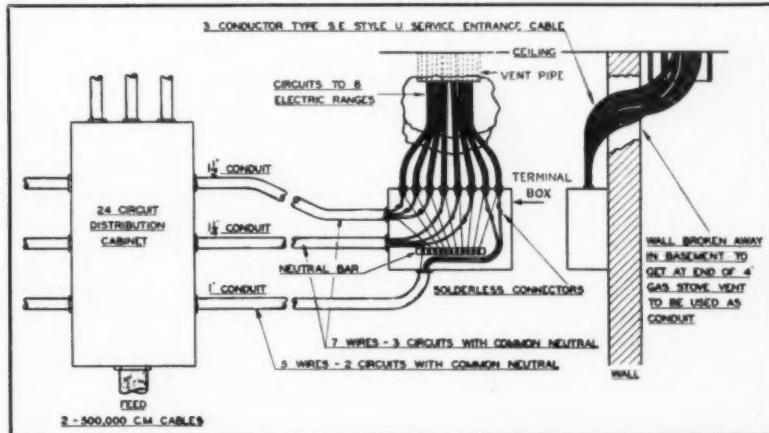
of the wiring between the central switchboard in the basement and the junction boxes and distribution cabinets in the three buildings "A," "B" and "C," which comprise the Towers group, is shown. The buildings are eight stories high.

The circuits are carried in con-

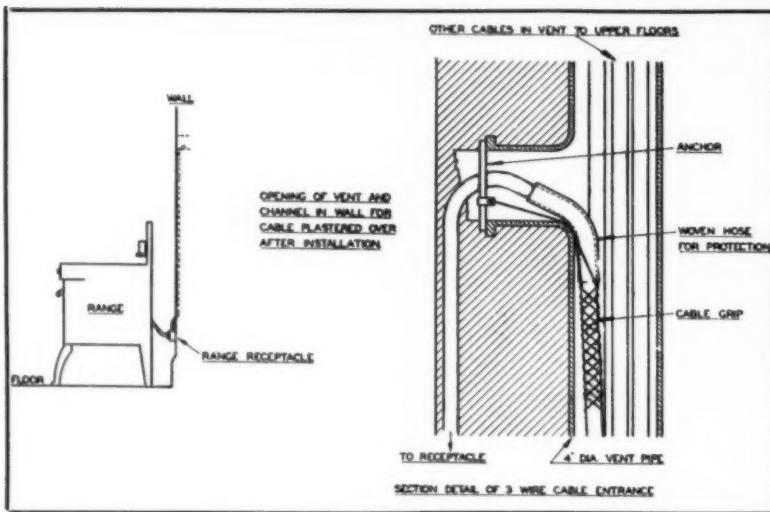
duit in the basements from the distribution cabinets to terminal boxes as shown, all neutrals being tapped to copper bars. Solderless connectors join the circuits and the cable which then runs upward through the vent pipes, each apartment having its own single-phase 115-230-volt



Method of serving Towers group of buildings for range operation.



Typical distribution center for range circuits, in basement.



3-wire circuit. Cable grips support the cable at the right-angle turns entering each apartment through the old gas range vent connection, with the grips anchored as shown. Woven hose is used to protect the cable at the right angle turns. The service entrance cable terminates at the range receptacle inside the kitchen in a 1½-in. square metal clamp provided by the range manufacturer. The four upper floors are served by No. 6 cable with No. 8 neutral to overcome the increased voltage drop, while the four lower floors are served by No. 8 cable.

Method of entering apartment kitchen for range service.

H. P. Rated Switch Selection

by H. B. Smith

*Associate Electrical Engineer
Underwriters' Laboratories, New York, N. Y.*

ONE PHASE of the general subject of enclosed switches which has been of particular interest during the past two or three years is the assignment of horsepower ratings for fused enclosed switches and the proper selection of such switches for motor-circuit use in the field. In this connection there are two separate and distinct items to be considered. The first involves the maximum horsepower ratings which Underwriters' Laboratories permits to be assigned to fused enclosed switches, with respect to their ampere ratings, *i.e.*, the capacity of the switch and fuses in any case. The second involves the problem of the contractor and the inspector in the field in determining that a fused enclosed switch with a horsepower rating selected for a given motor installation is suitable for the particular application.

It is recognized that the heating of fuses is a factor which has an important bearing upon the performance of enclosed switches, and a number of comments have been made to the effect that a fused switch

with a given ampere rating cannot always be depended upon to carry its full rated current continuously. The subject of heating of fuses within enclosed switches and similar equipment is now being studied very carefully by Underwriters' Laboratories; but the investigation has not progressed to the point where definite conclusions can be drawn. Accordingly, the following discussion assumes the ability of a fused switch to carry its rated current continuously.

Development

The present fused enclosed switch, consisting of a combination cutout base and externally operable switch mounted within a steel enclosure, has been evolved from the open knife switch and the separate cutout base of past years. The earliest enclosed switches (both with and without fuses) carried ampere ratings only—and these ratings were 30, 60, 100, 200, 400 and 600 amp., following the established ratings of knife switches and cartridge fuses. Soon after the establishment of the en-

closed switch classification, there began to be some demand for such switches with horsepower ratings for the control of motors; and Underwriters' Laboratories proceeded to recognize these horsepower ratings after the devices were investigated and found to be capable of making and breaking the stalled-rotor currents of actual motors. As the demand for horsepower-rated enclosed switches became greater and as the tendency toward higher horsepower ratings increased, Underwriters' Laboratories developed testing equipment, consisting of a suitable combination of resistors and reactors, approximating very closely the stalled rotor conditions of motors.

It is recognized that there is a limit to the horsepower rating which may be assigned to any given ampere-rated fused enclosed switch with respect to the capacity of the switch and fuses. The three principal factors which determine such a limit are (1) the ability of the switch and fuses to carry continuously 115 per cent of the full-load

motor-running current in question and for the fuses to hold up under the starting current of the motor, (2) the ability of the switch to make and break the stalled-rotor current of the motor, and (3) the correctness of the fusing under service conditions with respect to the requirements of the National Electrical Code. This last item is perhaps the most complicated one, since the ratio of the ampere rating of the switch and fuses to the full-load motor current may be one of the following:

- A. 115 per cent, if the device is regarded as providing the required manually operable disconnecting means.
- B. 125 per cent, if the device is considered to be a combination switch and cutout providing the required *motor-running* protection.
- C. 150 to 300 per cent, if the device is considered to be a combination switch and cutout providing the necessary motor *branch-circuit* protection.

Somewhat over six years ago the Laboratories began to give consid-

eration to the establishment of maximum horsepower ratings in connection with ampere-rated, fused enclosed switches. Values determined according to ratio A were considered to be unnecessarily high, since a motor controller having a capacity not less than 125 per cent of the full-load motor current is acceptable as a disconnecting means; and early in 1931 it was announced that the maximum permissible values would be based on the National Electrical Code requirement (ratio B) that the maximum rating of fuses when used as motor-running protective devices shall be 125 per cent of the motor full-load current. This practice which is in accordance with paragraphs 1 and 8 of Section 808-C of the Code has continued up to the present time.

Switch Ratings

Beginning about two years ago consideration has been given to a different method (ratio C) of determining maximum permissible horsepower ratings. Based on the assumption that the principal use of a fused enclosed switch is the combination cutout and switch mentioned in paragraph 808-b-2-z of the Code, the

Laboratories and the enclosed switch industry reached an agreement regarding the adoption of maximum horsepower values based on branch-circuit fusing. Accordingly, the June, 1936 edition of Underwriters' Laboratories' Standard for Enclosed Switches contains a table that gives the maximum horsepower ratings, which will become effective generally after Jan. 1, 1937. These values are lower throughout than the values based on ratio B; and, accordingly, the horsepower ratings of some fused enclosed switches now listed by the Laboratories will be reduced after the first of next year.

New Values Slightly High

Because of the range of fusing permitted for various types of motors (150 to 300 per cent), no given set of maximum values such as the table opposite can be made to satisfy entirely all of the conditions for branch-circuit fusing as given in Columns 7, 8 and 9 of Table 1 (pages 121-125, inclusive) Section 808 of the National Electrical Code. In some instances these new values are slightly high as the result of standardizing the ratings so that horsepower-rated switches will be suitable for use with the greatest possible number of types of motors. This results in some slight under-fusing of squirrel-cage and synchronous motors with respect to Column 7 of Table 1; but the discrepancies in question introduce actual differences in fuse sizes which are rather small and which can probably be neglected in view of the advantage of having a single horsepower rating which is applicable to all types of motors.

The principal voltage ratings in use in connection with horsepower-rated fused enclosed switches are as indicated below:

125 V, d.c.	230 V, 3 phase
125 V, d.c. and 1 phase	460 V, 1 phase
250 V, d.c.	460 V, 2 phase
250 V, d.c. and 1 phase	575 V, 1 phase
115 V, 1 phase	575 V, 2 phase
115 V, 2 phase	600 V, d.c.
115 V, 3 phase	600 V, d.c. and 1 phase
230 V, 1 phase	230 V, 2 phase

An ampere rating at any voltage value indicates that a switch is suitable for use with any current not greater than the rating given,

Maximum horsepower rating of a single-throw, fused enclosed switch, based on its ampere rating

Electrical Rating of Fused Switch		Switch Rating in Horsepower		
Volts	Amperes	Two-pole single-phase or d. c.	Three-pole three-phase	Four-pole two-phase, four-wire
115-A. C.	30	1		
	60	2		
125-D. C.	30	2		
	30	2	3	3
	60	5	7½	10
230-A. C.	100	10	15	20
	200	15	30	30
	400	30	50	50
	30	5		
	60	10		
250-D. C.	100	15		
	200	30		
	400	50		
	30		7½	7½
460-A. C.	60		20	20
	100		30	30
	200		50	50
	30		7½	7½
575-A. C.	60		20	20
	100		30	30
	200		50	50
	30	7½		
600-D. C.	60	15		
	100	25		
	200	50		

and at any voltage not greater than the value given. This does not apply in the same way where a horsepower rating is involved; for it is to be understood that any one of the ratings given in the table above is specific to the extent that it does not indicate the suitability of a switch for use at any other voltage, or for any other number of phases, or for alternating current when direct current only is mentioned and vice versa. For instance, a three-pole switch rated at 20-hp., 460-V, 3-phase would not necessarily be good for 20-hp., 230-V, 3-phase because of the higher current (practically double) which would affect the heating of the device and which would require larger fuses.

Select on Basis of Fuse Rating

In selecting horsepower-rated fused enclosed switches for particular applications, some confusion has resulted from the tendency to let the motor rating in question determine the switch, for the fusing does not always work out correctly in accordance with the National Electrical Code. A better method is to make the selection of the switch on the basis of the branch-circuit fusing required, and then determine that the horsepower rating is high enough for the motor rating in question.

The motor tables in the National Electrical Code contain complete data for the selection of proper fused enclosed switches in practically all instances, except where 2-phase, 3-wire motors are involved. It would be possible to make a supplementary table showing directly the fusing and correct switch ratings for all types and sizes of motors, but such a table would be rather cumbersome and somewhat complicated. In certain inspection districts abbreviated tables of this nature have been prepared and have been helpful. However, there does not seem to be any generally satisfactory short cut for the motor tables in the Code.

The proper use of these tables consists in determining first the full-load motor current for any particular application by referring to Tables 2, 3, 4, or 5 (pages 125-128), Section 808 of the Code. Then from Table 1 (pages 121-124) the correct branch-circuit fusing may be determined directly (Column 7, 8, or 9) for the type of motor in question. The size of fuses required will, in turn, determine the proper ampere

rating of the enclosed switch to be selected; and it is then necessary only to make certain that the horsepower rating of the switch is at least as great as the horsepower rating of the motor in question.

Supposing we have a 3-phase, 230-volt, squirrel-cage motor with a rating of 15-hp. From Table 5 on page 128 of the Code, the full-load motor current is found to be 38 amp. Then from Table 1 (page 122) it is found from Column 7 that the maximum branch-circuit fusing permitted is 125 amp. This means that a 200-amp. switch with clips for 101-200-amp. fusing is required. After having selected a 200-amp. switch for this job it should be checked to determine that it has a rating of at least 15-hp. Since, according to the new table of maximum permissible horsepower ratings, a 3-pole, 200-amp., 230-V switch may have a 3-phase rating as high as 30-hp., it is not likely that any difficulty will be experienced in finding a 200-amp. switch having a rating at least as high as 15-hp.

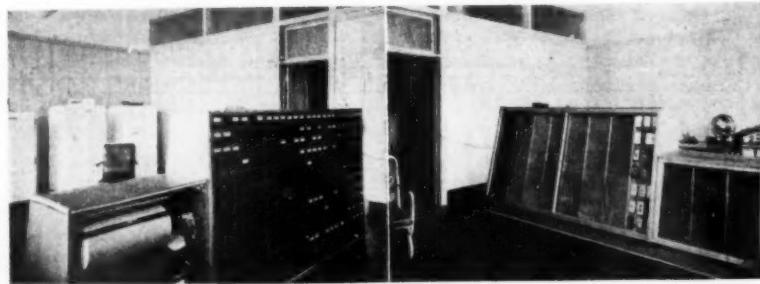
If on the other hand one were to start out with the 15-hp. rating

which is the maximum allowable for a 3-pole, 100-amp., 230-V switch, he would find that the rating of the switch and fuses would be less than the value of 125 amp. which is given in the Code table.

The conclusion is that a fused enclosed switch for motor-circuit use should be selected primarily with reference to its ampere rating, i.e., the capacity of the switch and fuses; and that the proper ampere-rated switch should be used regardless of the fact that the accompanying horsepower rating may be somewhat in excess of the minimum needed for the particular application.

There may be a few instances where fuse clips will be found to be too large for the maximum fuses permitted by the Code. This will be true particularly where time-lag fuses are employed in accordance with the fine-print note following paragraph 808-b-2-z of the Code. In such cases, the discrepancies can be handled only by the use of suitable fuse reducers. These are not particularly desirable; but, still, they are legitimate devices to which no real objection can be raised.

Triple-Purpose Office Cabinet



THE NEW office of the Pioneer Electric Company, Lincoln, Neb., was planned to minimize the space required for shelving and bins in order to preserve a neat office atmosphere. Accordingly, a spacious floor case was designed that serves, as shown, as a display case on the customer side, that forms a separation between the desks and the customer space, and which also accommodates 97 metal drawers on the rear side. These drawers are partitioned to permit stocking a wide assortment of small wiring supplies.

The front side of this case is glassed in to cover velvet mounting panels. The display side was sloped, from an overall case width of 24 in. at the bottom to 14 in. at the top of the case. One end of the case is 36 in. high and 36 in. long, to serve as a wrapping counter, while the main section is 8 ft. long and 53 in. high. The case is made of natural finished oak. The steel drawers are 11½ in. wide, 3½ in. deep, and vary in length from 8½ in. to 15 in. to take advantage of the difference caused by the sloped display side.

Courtesy in Reinspection

is building business for Louisville contractors

"**W**E will be very glad to extend any cooperation to whomsoever your licensed electrician may be, in outlining to him what is to be corrected in the building, electrically." So ends a typical reinspection report letter that was sent by the municipal electrical inspector to a tenant in a Louisville, Ky., apartment.

In the case of faulty industrial or commercial wiring, the department reports are submitted in complete detail in typewritten letter form. These are usually summed up as follows:

"To sum up our findings, there is no doubt in our minds that when the original wiring installations were made in this building, they were placed in a safe manner. Due to the company's expansion and shifting about of machinery and the adding of new machinery and appliances, there has been no effort made to increase the service, or the subfeeders, nor to add additional branch circuits to take care of the expansion and new equipment. Also the man who made many of these electrical installations since the original wiring, was not a qualified man, knowing very little or nothing about the proper material to use for an installation."

This manner of dealing with the public was adopted by Robert E. Barry when he became Louisville's chief electrical inspector. In the

Three-Point Reinspection Policy

THOROUGHNESS: — *Give each job a sufficiently thorough examination that its faults may be discussed in detail with the owner. Avoid hasty, superficial inspections and recommendations that will not hold water.*

ACCURACY: — *Put down in accurately edited letter form the reinspection findings. Insist that each inspector compile clearly worded reports that cover paragraph by paragraph all items which need correction.*

FOLLOW-UP: — *Treat each report with full consideration, whether the scope of rewiring be minor or extensive. Follow up these reinspections to a conclusion before tackling too many new cases.*

bank executive in charge of his institution's real estate holdings has rewired nearly 400 reinspected premises. This banker has become convinced that old wiring is dangerous, that it penalizes insurance rates on property, and that by correcting faulty wiring his properties are decidedly more rentable or salable.

Holds Public Good-Will

Here then is an effective approach to the irksome reinspection problem. It is a service that is rendered by a public official, which with impaired property values may easily be interpreted as confiscatory. Yet by organizing reinspection efforts from the beginning to conform to high standards of courtesy, by conducting inspections carefully and accurately, by maintaining absolute impartiality among all property owners, whether large or small, and by keeping away from acts tending toward favoritism among competing contractors, Mr. Barry holds the respect of all parties concerned.

The main points that have governed this department's reinspection procedure are thoroughness, accuracy, and follow-up.

When concise reports are made, the chances of confusion, or of only partially corrected jobs being done by electrical contractors, are greatly reduced. The public has confidence that the scope of work quoted on by competitive contractors is fair and equitable, because they have received a report which is in effect a rewiring specification. Contractors are willing to cooperate in bidding on reinspected jobs, because the reports do not leave loopholes for chisellers and, furthermore, because someone usually gets an order for the work within a short time after bids have been submitted.

A typical paragraph from a report covering three typewritten pages provides an example of thoroughness:

"We found wiring to machine motors improperly installed, constituting a life

two and a half years that he has been in charge, well over 600 written reinspection reports, and many more oral reports have been made to property owners and tenants. Of this total, only one instance of resistive litigation is of record. Moreover, one



Robert E. Barry, chief electrical inspector of Louisville, Ky., and assistants Ray Scherzer (left) and Wm. E. De Leuil (right).

and fire hazard; wiring to the offset-press motors improperly installed, subject to injury; wiring overfused and loose connections on switch mechanism; wiring to Kelly press motors improperly installed; armored cable with rubber covered wire lying in oil; insulation is saturated with oil and deteriorated. The wiring to job press motors is improperly installed, subject to injury, overfused, saturated with oil, and deteriorated insulation on wiring. This constitutes a life and fire hazard. We found on light circuits near water fixtures brass cell sockets not grounded constituting a life hazard. Wiring to the front elevator motor is oil soaked deteriorating the insulation. We found a main light service for building that is installed and made up of open type equipment. Upon our visit we found merchandise constructed of metal placed in and around this location, and vibration may at any time cause these articles to slip and fall across open and live switch contacts which would cause considerable

arcing to take place and might kindle a fire at any time. To our minds, this constitutes a serious life and fire hazard."

The inspection department follows through upon the completion of rewiring, to make sure that the proper credits are made on insurance ratings for the policies that an owner may hold. The public is often found to be unaware, or to have forgotten that extra charges were being paid for electrical defects.

Most of the 137 licensed contractors in Louisville have done one or more rewiring jobs, of which a number have amounted to \$5,000 or more. Mr. Barry attends meetings of contractor associations and of the Electrical Clearing House, where he discusses the procedure of reinspection, its objectives, and how the contractors can best cooperate with the inspectors. Because of this frank open-

door policy, the contractors have helped to sell the elimination of faulty wiring, and they have also cooperated in supporting the inspectors' clean-up efforts, without creating an impression with the public that this program is in any sense a racket.

Mr. Barry came into his present position after having been an electrical inspector for the state fire marshal of Kentucky. He and one assistant conducted for a considerable time all inspections in this city of 317,500 population. Realizing that much overloaded and otherwise hazardous wiring existed throughout the city, these two men worked overtime in a systematic clean-up effort. More recently a third man has been added to the staff, which will make it possible for reinspection to go forward more rapidly.

Shop Fabrication to Defeat Cold Weather

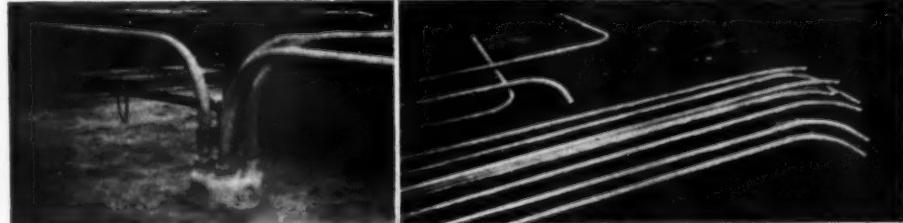
A JOB that required about 19,000 ft. of concealed raceways was roughed in out-of-doors and the concrete poured during mid-winter without labor handicaps being incurred by the electrical contractor. Careful planning enabled the Best Electric Company of Ames, Ia., to lay out the various outlets on the concrete forms and nail down the outlet boxes, after which measured lengths of $\frac{1}{2}$ -in. to $1\frac{1}{4}$ -in. electrical metallic tubing, as required for a particular section of that floor, were bent and assembled in the shop. It took only about three hours to complete a section in readiness for concrete pouring, under the system followed.

This work was done in a new dormitory for women at the Iowa State College at Ames. Twelve different electrical systems were in-

cluded in this contract, requiring for the first floor slab alone a total of 466 separate stubs, most of which entailed bends that were all made up at the shop.

Definite savings were realized by the electrical contractor through limiting the time that mechanics had to work in the cold. Instead of fumbling with gloved hands at tool benches with rules, hacksaws and benders, theirs was merely a job of attaching various lengths of bundled tubing into complete runs. Moreover, no box fastening nor attachment of box connecting accessories needed to be done while handling cold lengths of tubing. The general contractor was likewise able to proceed more promptly with concrete work when the weather moderated enough to permit another section of concrete being poured.

Outlet boxes were spotted and nailed down upon the concrete forms complete with connectors all ready to receive shop-bent tubing. Holes to receive the switch drops were likewise bored when the boxes were spotted.



The feeder and circuit runs that stubbed up to panelboards were also installed quickly, because they had been routed on the plans beforehand to permit most of their make-up in the warm shop.

Bundles of shop-bent and assembled tubing were brought to the section that was ready for pouring concrete and could be made up in about three hours' time.

CHECKING

**A system for checking estimates
as well as job progress**

JOB NO. _____	WEEK ENDING _____	WM. K. GRACE ENGINEERING CO. DALLAS, TEXAS
WORKMAN _____	RATE OF PAY \$ _____ PER HOUR	
NOTE: USE SEPARATE SPACE FOR EACH CONDUIT & WIRE SIZE		SAT SUN MON TUE WED THU FRI TOTAL HOURS AMOUNT
OUTLETS: LAYING OUT, NAILING DOWN, NIPPING OUT, & PLASTER RINGS		
FINISHING: INSTALLING RECEPTACLES, SWITCHES, & FAN HANGERS		
PANELS: SETTING CABINETS, TAGGING & CONNECTING CCTS., COMPLETE		
MOTOR WIRING: ACTUAL CONNECTIONS AT MOTOR ONLY		
SAFETY SWS. & CONTROLLERS: MOUNTING & CONNECTING		
CONDUIT:		
WIRE:		
MISC. (GIVE DETAILS)		
TOTALS		

Workman's Time and Production Report Form.

BELOVING that a correct estimate for doing a large job is of no greater importance than to have an accurate record of the actual cost to complete that job, the Wm. K. Grace Engineering Company of Dallas, Tex., has worked out its own system of preparing estimates to make them readily checkable, and a corresponding system to check the job as it progresses. No claim is made for anything different in the way of labor units, or of unusual skill on the part of its crews. It's all a matter of how carefully the estimate is taken off and entered, says Mr. Grace. And finally, it depends upon the willingness of a contractor to learn the facts about

job performance. Estimates must be based on reliable cost data obtained from previous job experience, and there is no end to the amount of variables for which the wide-awake contractor should be constantly on the look-out.

Divisional Time Studies

Every important job done by his company is an experimental labora-

WM. K. GRACE ENGINEERING CO.					
Name of job _____	Date _____				
Floor _____	Takeoff by _____				
CIRCUIT RUNS					
number of wires	2	3	4	5	6
wire size (scratch one)	14-12-10	14-12-10	14-12-10	14-12-10	14-12-10
cond.	1-1-1	2-2-1	2-2-1	3-1	3-1
scaled feet & inches	-	-	-	-	-
change feet to inches	+	+	+	+	+
scaled inches	-	-	-	-	-
TOTAL	"	"	"	"	"
plan scale multiplier	X	X	X	X	X
TOTAL LENGTH CCT. RUNS	"	"	"	"	"
HOME RUNS					
number of wires	2	3	4	5	6
wire size (scratch two)	14-12-10	14-12-10	14-12-10	14-12-10	14-12-10
cond.	1-1-1	2-2-1	2-2-1	3-1	3-1
scaled feet & inches	-	-	-	-	-
change feet to inches	+	+	+	+	+
scaled inches	-	-	-	-	-
TOTAL	X	X	X	X	X
plan scale multiplier	X	X	X	X	X
TOTAL HORIZONTAL RUNS	"	"	"	"	"
number panel entrances	X	X	X	X	X
length each entrance	"	"	"	"	"
TOTAL FEET PANEL ENTR.	"	"	"	"	"
TOTAL HORIZONTAL RUNS	+	+	+	+	+
GRAND TOTAL HOME RUNS	"	"	"	"	"
OUTLETS			FANS & FIXTURES		
ceiling (flat slab)	with wire	empty	52" ceiling fan only		
ceiling (pan or tile)			" " " with fixture		
ceiling (suspended)			ceiling fixture (plain)		
brackets			" " (with chain)		
fan hangers			bracket fixture		
clock outlets			EXIT fixture		
Floor boxes					
wall switches	pilot				
" "	lock				
" "	3-way				
" "	4-way				
" "	single				
" "	2-gang				
" "	5-				
" "	4-				
" "	5-				
" "	6-				

Floor-by-Floor Take-Off Form

Feeder Schedule and Riser Diagram

Pricing Sheet for Material and Labor

tory as to labor costs. Each crew is made familiar with the use of daily time reports that carry a distribution of the day's work. These reports give the facts concerning each man's production.

There are eight major divisions into which a mechanic's time may fall. Because the crews on large work rarely shift back and forth over a confusing mixture of operations, the men have little difficulty in filling out their reports correctly. If errors occur, there is always the foreman as a last check. It will be noted that there are no spaces for entering the quantities of material installed. How many check forms have contractors used, in which the total estimated footage of conduit was reported installed although the job was yet only 75 per cent roughed in? This company does not care to burden the men or the foreman with estimating its day's production. The estimates are made up to take care of that problem in the office.

It is a simple matter to tabulate the time reports upon a standard accountant's tabular pad, using the

required number of columns to correspond with the principal items that are being checked. The estimated costs for each divisional item can be set up thereon as a weekly reminder, and as a final comparison with the actual costs.

Floor-by-Floor Take-Offs

Although the time report system is maintained primarily for obtaining reliable cost data for future guidance, the system of taking off floor-by-floor estimates permits the progress of work to be checked as closely as may be desired against the time reports. It will be noted that the original take-off is posted on a separate sheet for each floor; also that the circuit runs and the home runs are entered in separate groups. Thus a certain floor may be checked up on its own page, without the chance of getting quantities or totals from another line that covers a different floor.

As a check-back against the take-off, the method of posting measured quantities has been arranged to record on the estimate form everything

pertaining to a rotometer reading. Errors, as sometimes occur in converting feet to inches or in converting inches to $\frac{1}{4}$ -in. scale feet, are less likely to occur when the estimator becomes accustomed to his printed form. The various outlets occurring on each floor are likewise posted in the box form at the lower portion of the take-off sheet.

Schematic Feeders Summary

Before the feeders are measured, they are laid out on the schematic riser section, the power feeders being kept to the right side, and lighting feeders to the left. A somewhat similar schematic system was developed to cover special communication riser systems, such as telephone conduits. With jobs so often rushed for bidding time, these sketches can be made quickly with a lead pencil, thus preserving a permanent record of the riser scheme by which an estimate was prepared.

Error Prevention in Costing

Final listings of materials are made upon the required number of pricing sheets. These sheets carry columns from left to right for noting the size, description, quantity, unit cost and extended cost of each item of material. The labor columns are reversed, namely the labor unit appears at the extreme right, while the extension is posted in the column adjacent to the material extension. This company prefers to keep extensions of material and labor side by side, where quick-check comparisons of these totals may be made to catch possible errors in multiplication that might otherwise slip by. Blank spaces were left to separate the material pricing columns from the quantity column at the left, and the labor pricing column at the right. This was done to lessen the danger of run-overs into the wrong columns, an error that can sometimes cause considerable trouble, or perhaps cause one to get a job that isn't profitable.

The parts of this company's record system that are shown are most vital to the gathering of reliable cost data. Careful scrutiny and recording of the incoming reports causes such a system to grow more useful as time goes on. In addition, the actual labor costs of special operations of a miscellaneous nature are kept and noted under looseleaf tabs until some day a similar job comes along for which the information is invaluable.



Easy-to-Maintain

Adjustable Lighting

HIgh intensity, completely adjustable lighting units were recently installed at the University of Louisville, Ky., Medical College, which provide individual local illumination for the dissecting tables in the department of anatomy. Because these tables are portable, and because fixed underfloor wiring was considered unsuitable, a method for suspending these local lighting units was developed which required no floor conduits or floor braces, and no connections to the dissecting tables.

The methods of design and installation, therefore, provide lighting equipment that withstands rough treatment by the medical students, but which is also readily adjustable by them to any reflector angle or position desired. Once set in any position the reflectors will not sag or creep out of position or adjustment. Furthermore, the methods of assembly permit quick removal of all or any part of this equipment from its supporting bars for the regular removal of all dust, germ or lint accumulations. Because under-floor or top-of-floor wiring and supports were entirely eliminated, the tile floor did not need to be punctured. Thus the floors are given thorough scrubings without leakage of water to lower floors, and likewise, there is no part of the wiring system subjected to harm from floor scrubbing solutions. Because the reflector supporting structure is composed of grounded conduit runs, to which the bronze clamping fittings, and successive reflector adjusting knuckles connect, the steel reflectors and housings are likewise effectively grounded.

The wiring system that served thirty-nine of these tables and one

hundred and fifty-six lighting units in two large classrooms, was routed through horizontal ceiling-suspended conduits. These runs consisted of 1½-in. rigid iron conduit for each row of five tables, with ring hangers provided at approximately 12-ft. sup-



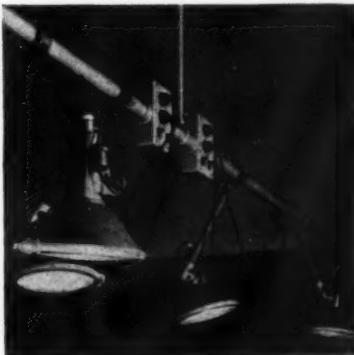
porting centers. The clusters of adjustable arms and their four lights that were provided over each dissecting table could safely be attached to these rigid conduit runs. Special friction clamping fittings were developed to fit 1½-in. conduit, and to also furnish a positive support for the adjustable fixture stems.

Each horizontal run of 1½-in. conduit was provided with two 3-gang threaded device fittings above the approximate position of each dissecting table. Each fitting contains two single T-slot receptacles, and two compact tumbler switches combined in the third device space. This device combination provides a switch-controlled plug outlet for each of four lighting units.

The adjustable fixture arms are wired with reinforced lamp cord, with sufficient cord length to reach the plug outlet under any reasonable shifting of the various lighting units along the supporting conduit. Cord connectors were interposed in the flexible wiring between the reflector socket housing and the adjustable arms, to permit the quick replacement of any reflector unit.

When either classroom is to be given a thorough cleaning, it may quickly be stripped of all lighting equipment as well as the portable dissecting tables and stools. All that remains fixed or permanently attached to the structure are the horizontal conduits, their suspension rods and cross-braces, and the smooth-surfaced plugging fittings.

This installation was made by the Marine Electric Company, of Louisville, under the direction of Dr. S. I. Kornhauser. Dr Kornhauser and his staff designed the special clamp fitting used in this installation.



Motor Winding Alteration Charts

MOTOR rebuilders and repairers are frequently criticized for altering motor windings from the original specifications. Such criticism is justified if the change produces operating characteristics not equal to the customer's expectations. This frequently occurs when the shop operator re-winds the motor for a different speed without a full knowledge of design factors. Motors may, however, be changed from 2 to 3-phase or 3 to 2-phase with no material change in operating characteristics. Three-phase windings may be changed from single or multiple star to single or

by F. W. Willey

Willey-Wray Electric Co.
Cincinnati, Ohio

multiple delta and vice versa without ill effect, provided the new winding is correctly calculated as to turns per coil and size of wire.

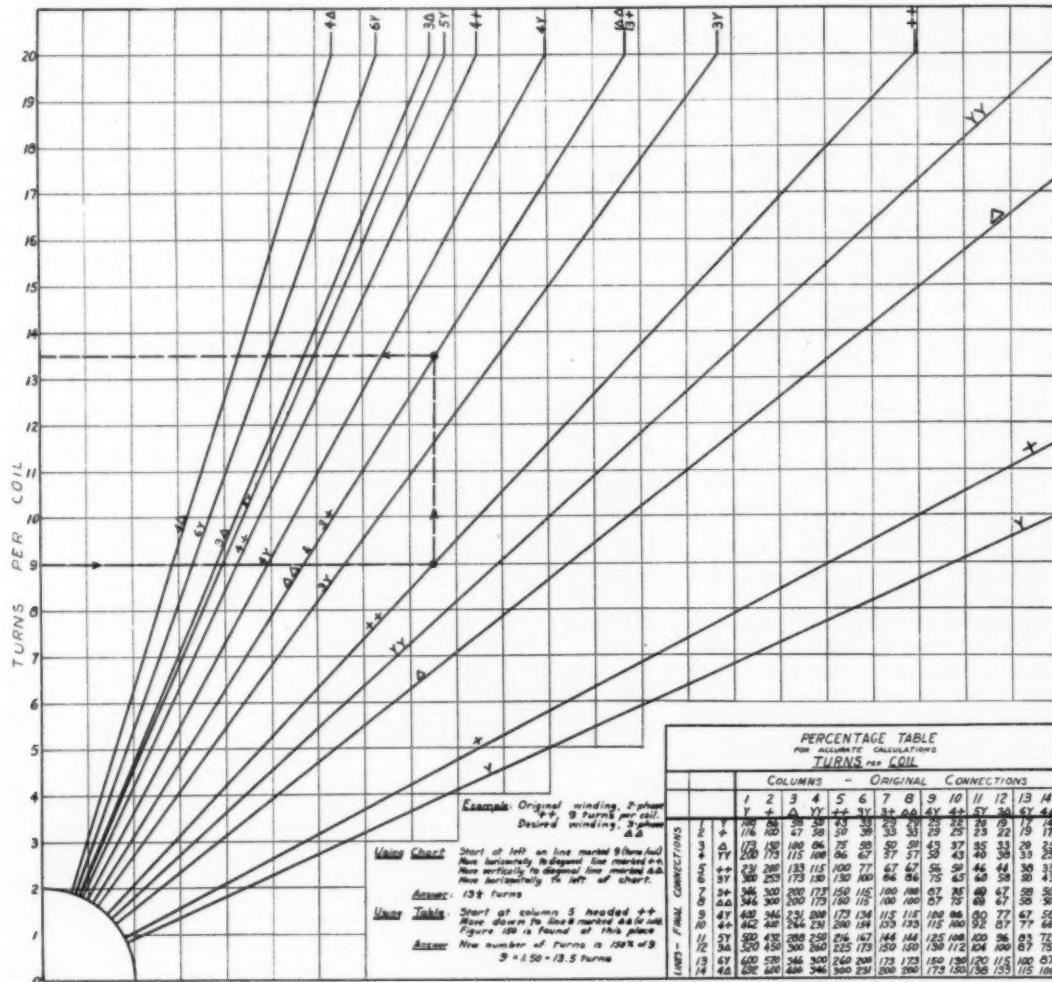
The purpose of this article is to provide two simplified methods of determining the equivalent turns and size of wire for the various connections for 2 and 3-phase. If the original winding is known, any new winding can be quickly determined. There is a mathematical relation-

ship between the various windings and this has been worked out for fourteen different connections for convenient use by either practical workmen or technical engineers.

It is assumed that persons using this material understand that some changes are impractical. Triple connections will not be chosen for 4, 8, or 10-pole motors, but may be used on 6 or 12-pole windings. Occasionally a motor will have a number of slots which may not permit symmetrical arrangement of polar coil groups when the change is from 2 to 3-phase or vice versa.

Assume that a 2-phase 220-volt

1. STATOR REWIND CHART—TURNS PER COIL



motor is to be rewound for 3-phase 220 volts, and that the original winding consisted of 9 turns per coil of No. 16 wire, with the connection double plus. Further, assume that the 3-phase 220-volt winding shall be connected double delta. The problem is to determine the proper number of turns per coil and the proper wire size.

Determinations by Chart Method

Chart No. 1 contains a diagonal line for each of fourteen connections (double delta and three plus using one line in common). At the left side are shown various turns per coil from 0 to 20. At the "9 turns" line move right horizontally to the intersection of the diagonal line marked "double plus." From this point, move vertically to the diagonal line marked "double delta." Then, moving horizontally to left of chart, a point midway between 13 and 14 is

reached. The new winding should have $13\frac{1}{2}$ turns per coil for identical results.

Chart No. 2 is similarly constructed, except that the diagonal lines are parallel instead of radiating from the corner. The operation is the same as in Chart No. 1. The left side lists wire sizes No. 7 to No. 27. Starting at No. 16, move right horizontally to the diagonal line marked "double plus." Move vertically to the line marked "double delta," and then horizontally to left side of chart. This point is between No. 17 and No. 18, but closer to No. 18.

Conclusion:

Turns per coil, either 13 or 14.
Size of wire, either 17 or 18.

Determination by Table Method

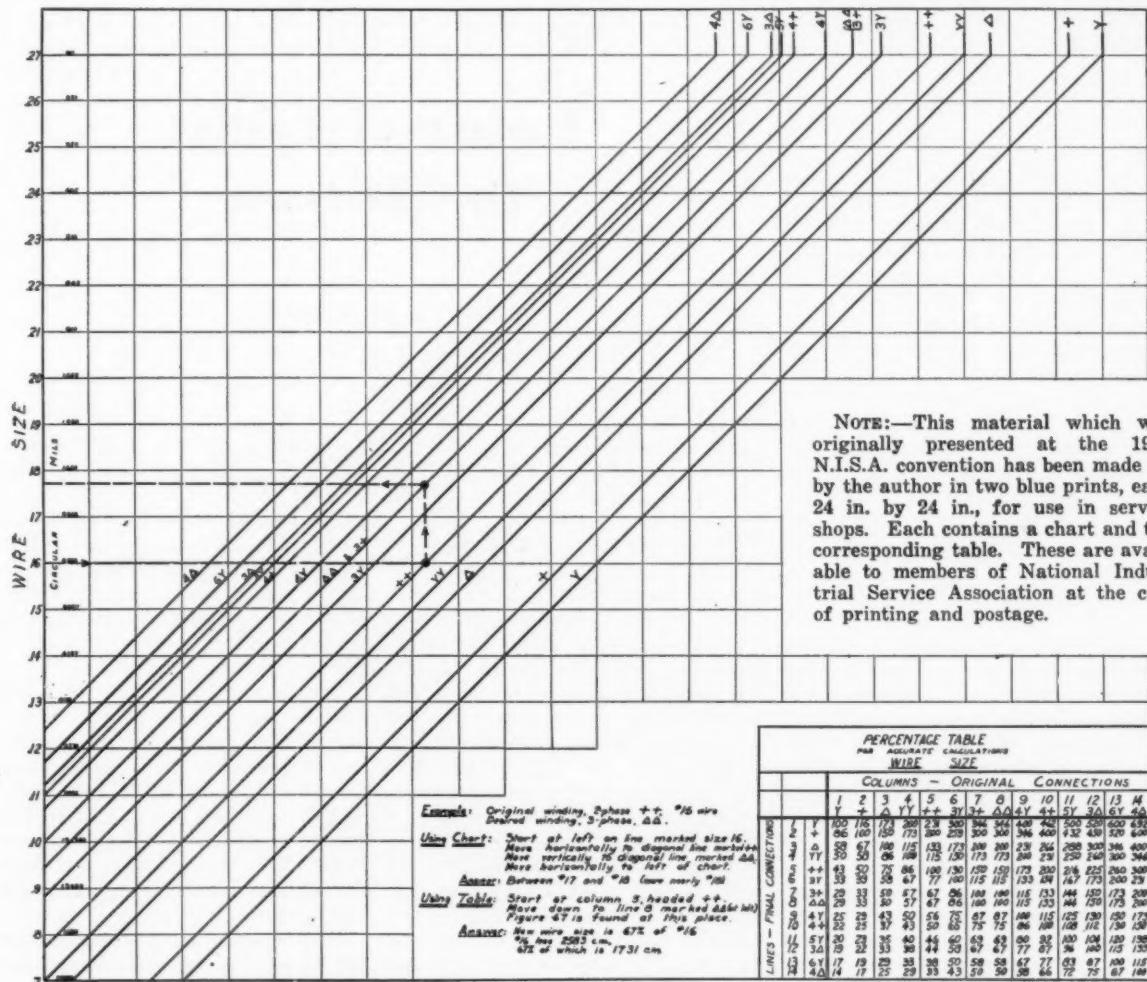
It will be noticed that with each chart there is a table of percentages for accurate calculations. The tables

have fourteen columns and fourteen lines of figures. At the head of each column is a connection designation: Star, Plus, Delta, Double Star, etc. The lines are similarly marked from top to bottom. All figures represent percentages.

Table 1. Start at column marked "double plus" (column 5) and move down to line marked "double delta" (line 8). The figure is 150. This multiplied by 150 per cent = 13.5 turns. This is the same result as secured by chart.

Table 2. Start at the same column, double plus (column 5), and move down to the same line, "double delta" (column 8), and find the figure 67. The original wire No. 16 has 2583 cir. mils. This multiplied by 67 per cent = 1731 cir. mils, which is slightly more than that contained in No. 18. This confirms the result secured by the chart method.

2. STATOR REWIND CHART—SIZE OF WIRE



NOTE:—This material which was originally presented at the 1936 N.I.S.A. convention has been made up by the author in two blue prints, each 24 in. by 24 in., for use in service shops. Each contains a chart and the corresponding table. These are available to members of National Industrial Service Association at the cost of printing and postage.



1. The Esplanade of State looking toward the Texas State Building crowned by the beams from 36-in. 60,000,000 cp. searchlights. The mobile color lighting in the courts on either side and behind the figure represents one of the largest installations of this type ever attempted.

Colored Light in Motion

A NEW milestone in the progress of illumination was achieved at the Texas Centennial Exposition in the use of synchronized color in motion. This lighting spectacle, one of the largest of its kind ever attempted, was created in the Esplanade of State.

A large area enclosed almost entirely on two sides and limited by the Texas State Building on the southeast created an opportunity for using colored lighting on a great scale, to produce a range of moods for the spectators and a background for the accent points in the picture.

In this setting, (Fig. 1) a vista in every direction, some visitors spend hours drinking in the beauties and enjoying the different atmosphere constantly but subtly changing on the sheer walls of the courts and backgrounds of the niches through the use of four colors of light automatically controlled through reactors and thyratron tubes. The reflections in the long sheet of water in the center multiply the effects in rippling color. All other lighting on the fountains, pylons, murals, entrances and towers is static in color or white light as the part of the particular

composition dictates. The brightness of each is carefully controlled to give a unified picture with emphasis where needed.

Six niches are the high spots in the scene (Fig. 2). The neutral-colored backgrounds behind sculptured figures have blue and green light projected on them from units located in the pits at the bottom. The blue is static, while the green is controlled in brightness by the reactors and tubes. The pattern projected on to this field of blue and blue-green is in three colors,—white, amber and red. Each color is in a separate control circuit. The cycle is shown in Fig. 4. All mobile color circuits in the six niches are synchronized from master control located in the Electrical Building. In this way the same color-pattern ap-

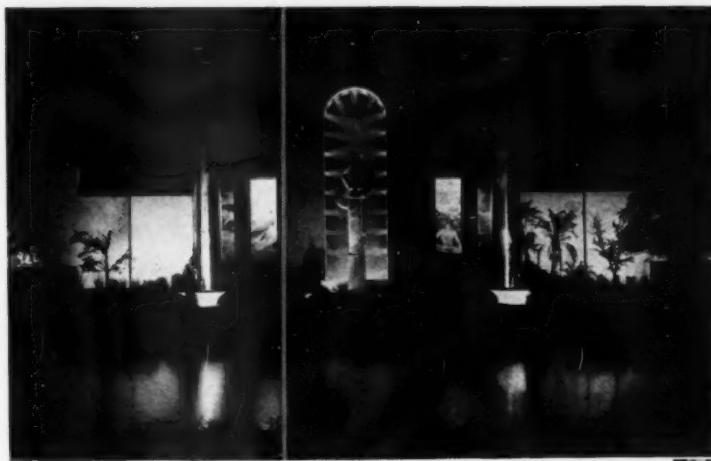
pears at exactly the same moment. The size of the projectors is given in Fig. 4.

The four great courts, two in each group of structures on either side of the pool, are lighted in four colors—amber, blue, green and red—from 1000-watt lamps in floodlights with Alzak reflecting surfaces and A-Symetric lenses. The ratio of colors is shown in Fig. 4. The total wattage per square foot of wall area is 26. A wide range of color mixtures is produced with each color on separate control. Here again each color on both sides of pool is kept in synchronism through the master controller. The schematic diagram shows the arrangement of each color control circuit.

The reactors and thyratron tubes controlling the d.c. input in each are

by C. M. Cutler

*Illuminating Engineer of Texas Centennial Exposition
in Charge of Lighting*



located in two rooms, one in each group of buildings on either side of the pool. Control wires from the master on one side are installed underground to the control room on the opposite side.

All circuits with mogul base lamps are fused for 40 amp. Each circuit is run direct to the mobile color control room and all fusing is done in the panel at that location. Three and four conductor No. 8 Trenchlay cable is used underground to each junction box and from there wired

2. One of the niches with part of the great courts on either side. The murals behind the massive columns are lighted from above. Two of the large step lighting units frame the view of the niche.

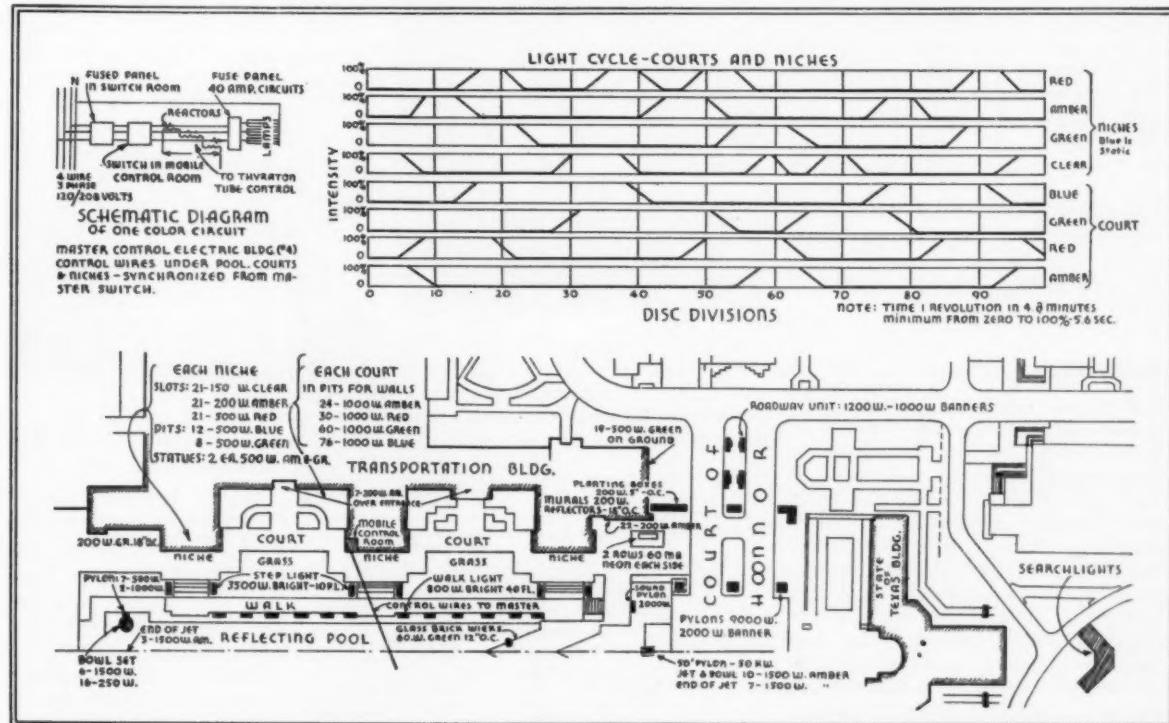
3. A view of 1000-watt floodlights along the base of one wall.

to twistlock receptacles in weather-proof outlet boxes.

N. E. Busby & Company, Dallas, were the electrical contractors who

made the installation of floodlighting and control. Illustrations courtesy of Nela Park engineering department of General Electric Company

4. A lay-out plan of one half of Esplanade of State, cycle for mobile color lighting and diagram of one circuit.

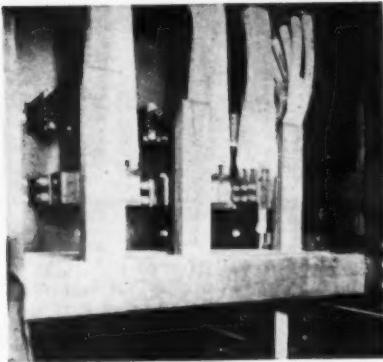


Construction . . .

Methods . . .

Fireproofing Massed Conductors

To reduce the possibility of an insulation fire occurring at groups of feeder cables where they were bunched at their termination on rear-of-board busses, the Electrical



Engineering & Repair Company, Atlanta, Ga., applied layers of asbestos tape over each phase group in connection with the remodelling of an Atlanta department store for air conditioning. A 2,500-amp. circuit breaker was provided on the switchboard to control eighteen 500,000 c.m. feeder cables connected six conductors per phase. The fire-proofing was applied over the massed conductors from their lug terminals to the point where they entered six 3-in. conduits in the overhead pull box.

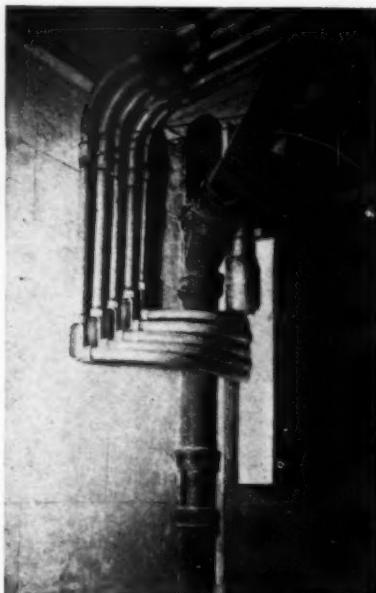
Cable-Sag Bushings

Because of their sag weight, heavy feeder cables that enter conduits in a horizontal position are liable to become pinched or worn through at bushings from vibration. To safeguard against such insulation breakdowns the Wm. K. Grace Engineering Company, Dallas, Tex., installs extra protective insulation at the bushings. After a run of cable has been pulled and formed in its final position, pieces of heavy sheet fibre are slipped under and around the cables at the point where they rest

upon the conduit bushing. Installations of heavy feeder cables that were made in this manner twenty-five years ago are said to show no sign of the fibre having worn through to the cable braid.

Riser-Clearing Saddle Bends

A group of feeder conduits entering the side of a drip-shielded power distribution panelboard were kept close to the side wall, yet "straddled"



a 6-in. soil pipe, in an Orange, N. J., brewery modernizing job by laying out uniform staggered sweeps or saddles to align with their staggered conduit fittings. As a result the Ed-

ward J. White Company of Newark, N. J., obtained a neat and substantial arrangement of these conduits which did not project awkwardly from the wall. These runs, consisting of four 1½-in. and one 1-in. conduit were arranged to align their conduit fittings for easy access to the covers and openings.

Wrong-Current Safeguard

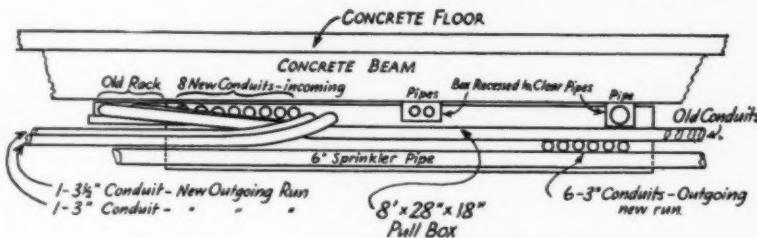
To avoid testing a customer's equipment from the wrong current supply, the Porter Electric Company, Minneapolis, Minn., has applied a heavy coat of bright red enamel to the plate and to the face of a duplex receptacle that is connected to d.c., so as to readily distinguish this outlet from its companion a.c. outlet. Both outlets are set flush in the top of a service department counter. This inexpensive method of identification prevents the possibility of a busy counter-man causing damages to portable devices by accidentally plugging them into the incorrect source of current.

Pipe Cross-over Box for Heavy Feeders

To install eight feeder conduits along a crowded department store ceiling and not obstruct limited headroom at busy aisles in the stock rooms, the Electrical Engineering & Repair Company, Atlanta, Ga., designed a junction box which permitted a 6-ft. off-set in the line of conduits while it also cleared other piping that blocked the feeder routing that was desired. The box



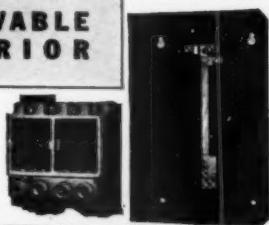
was made 8 ft. long, 28 in. wide, and 18 in. deep, and was provided with sectional screw covers at the bottom.



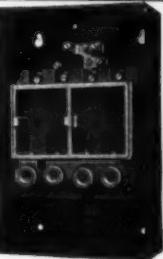
Sensational NEW C-H RANGE SWITCH

with the
3 BIG FEATURES

1 REMOVABLE INTERIOR



2 DEAD-FRONT CONSTRUCTION



3 NON-INTERCHANGEABLE MAIN AND RANGE SWITCH PULL-OUTS



Features which make this an Outstanding Leader

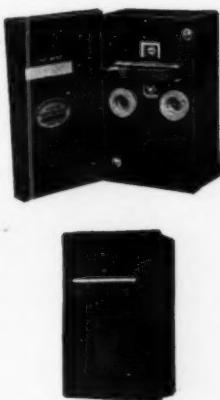
The new 4334H15 Range Switch announced by Cutler-Hammer is creating a sensation wherever it has been seen. Here are just some of its outstanding features:

Loosening one self-locking screw permits you to lift out the entire switch assembly for easy installing, pulling wires, etc.

4334H15 has complete dead-front construction — for safety. Main and range switch pull-outs are non-interchangeable, constructed of tough C-H Thermopax insulating material and employing contacts of ample current-carrying capacity with heavy fuse clips—they guarantee trouble-proof performance.

And—the New 4142H1 WATER HEATER SWITCH

It's modern; it's good-looking; it has every desirable feature needed for modern service requirements.... Dead-front construction . . . silver-plated contacts . . . positive make and break . . . facilities for locking in either on or off position . . . entire assembly easily removed. 30 amps. capacity, 125-250 Volts A. C. 2-blade, 2-plug fuse, grounded neutral.



Other features are, briefly: solderless terminals with slotted hex-head screws; solid porcelain barriers between terminals prevent short circuits; fuse-test holes (you don't interrupt service); the tough, durable case is finished in C-H mar-proof black; ample wiring space on all sides; plenty of knockouts conveniently placed (meter twist-out at top available). Rating: 60 amp. capacity main and range switches with 4 branch circuits, 35 amp. tap for extra distribution panel or hot-water heater. The 30 amp. terminals have the easy-to-wire C-H holes. CUTLER-HAMMER, Inc., Pioneer Manufacturers of Electric Control Apparatus, 1306 St. Paul Avenue, Milwaukee, Wisconsin.

CUTLER-HAMMER  **SAFETY SWITCHES**

ELECTRUNITE

REG. U. S. PATENT OFFICE



POSITIVE, UNIFORM
PROTECTION
AGAINST RUST AND
CORROSION
AT EVERY POINT

KNURLED INSIDE SURFACE
Patent No. 1,962,876

KNURLED INSIDE FINISH AVAIL-
ABLE IN $\frac{1}{2}$ ", $\frac{3}{4}$ " AND 1" SIZES





for electrical wiring



• The conduit system which encloses electrical wiring is only as resistant to the attack of rust and corrosion as its weakest point. With this thought in mind, ELECTRUNITE Steeltubes is processed to insure UNIFORM protection at every point.

The electric resistance welded steel tubing is, in itself, resistant to corrosion. To increase this resistance, a tight coating of zinc is applied uniformly to every part of the surface by an exclusive electrical method. In this way the positive protection of zinc is evenly distributed—not unnecessarily heavy here or dangerously thin there.

The coating is remarkably smooth and tight. It will not flake or crack under severe bending. And, because ELECTRUNITE Steeltubes is threadless, there are no threads to cut—no damage to the protective coating at boxes and connections nor from pipe wrenches—vices or dies.

Thus, when you use genuine ELECTRUNITE Steeltubes, you insure long life in the electrical system through positive, uniform protection against rust and corrosion. In addition, through ease of handling and installation, and through the patented knurled inside surface that makes wire pulling easier, you will be able to secure more contracts at profitable figures. You can obtain complete detailed information in Sweet's Catalog, from your electrical wholesaler or by writing us direct. The original genuine ELECTRUNITE Steeltubes cost no more than imitation brands.

SUBSIDIARY OF
REPUBLIC
STEEL CORPORATION

Electrical Division
Steel and Tubes Inc.
WORLD'S LARGEST PRODUCER OF ELECTRICALLY WELDED TUBING
CLEVELAND . . . OHIO

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FLOODLIGHTS

with New Sales-Making Features



MULTIPLE MOUNTING

Three floodlights where there was only one before

INDIVIDUAL LIGHT CONTROL—adjustable heads give individual flexibility—can be turned in any direction or tilted up and down

CAST ALUMINUM

BRACKETS—special design eliminates usual litter of pipe fittings, tees, elbows, nipples, etc.

REFLECTORS—heavy steel construction porcelain enameled green outside, white inside.

Now Quad makes possible new lighting business—now you have a better opportunity to make more economical and more flexible installations—now you have better selling points—now is the time to hit hard with these new Quad units—write today for complete details.

QUADRANGLE
MANUFACTURING CO.
30 So. Peoria St. Chicago



Its upper surface was recessed in two places to clear piping, but enough depth was provided to accommodate eighteen 500,000 c.m. cables that were run through its length.

Compact Cost Reference System

A card index tray made of metal is used in the office of the Davenport (Ia.) Electric Contract Company for making up cost records on job work sheets and for pricing estimates. Each half of this tray is 6-in. wide and 18-in. long, yet 232 standard 3-in. by 5 in. file cards may be placed back-to-back in individual hinged

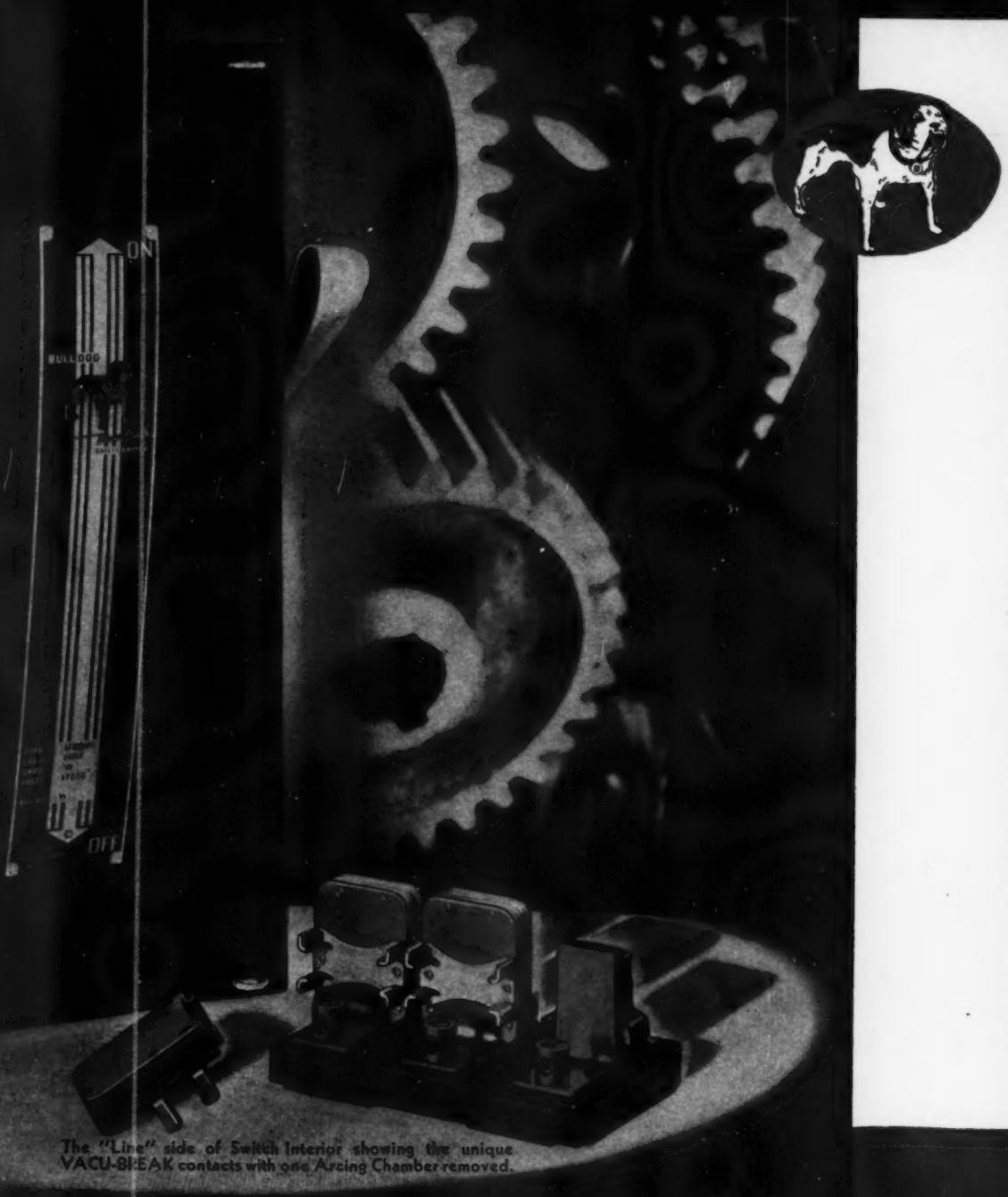


paper holders. This arrangement permits the listing of 2320 separate items on 10-line cards. The items are arranged in the trays in alphabetical order for quick reference, the bottom of each card bearing an index title. Edna Korwoth, bookkeeper, is photographed while entering some material costs from the card system to a job cost sheet.

This company does not maintain a perpetual inventory card record, but only provides entries of net material costs. Current selling prices are obtained regularly from an outside pricing service organization. The various persons in the company that have occasion to post material costs upon job cost records or upon estimate sheets claim that this compact tray is very handy, and that it speeds up clerical routine.

Fastening Boxes in Column Forms

Large gang boxes which occur in the concrete columns of a San Antonio, Tex., bank building were made secure in their exact positions by bolting them to the inside of the wooden column forms. Wright Brothers, local contractors, used



The "Line" side of Switch Interior showing the unique VACU-BREAK contacts with one Arcing Chamber removed.

BULL DOG

Vacu-Break

STANDS FOR ALL THAT
IS Modern IN CIRCUIT CONTROL

Ask your
Electrical
Supplier for
details and
prices.

Every modern feature is found in the new Bull Dog VACU-BREAK Safety Switches—stylined compact cabinets—Doubly Sealed arcing for extreme safety switching—almost ease of installation with solderless wire grips. We believe Bull Dog VACU-BREAK Safety Switches to be the most efficient Safety Switches ever designed.

BULL DOG ELECTRIC PRODUCTS CO.

Manufacturers of Safety Switches, Panels, Light and Power Panel Boards, Switchboards, Duct Systems

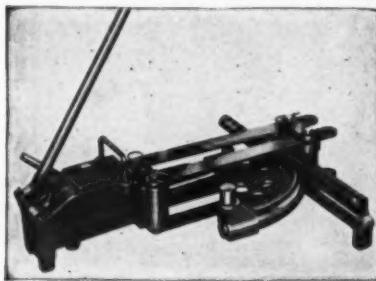
Bull Dog Electric Products of Canada, Ltd., Toronto, Canada

DETROIT, MICHIGAN

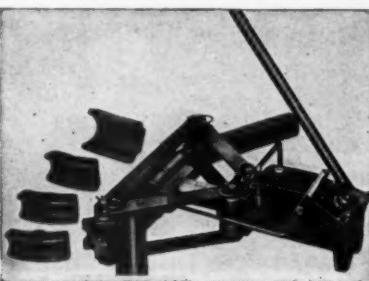
YOU CAN SAVE time and money WITH GREENLEE TOOLS

CONDUIT BENDERS • KNOCKOUT TOOLS • PIPE PUSHERS • BORING TOOLS

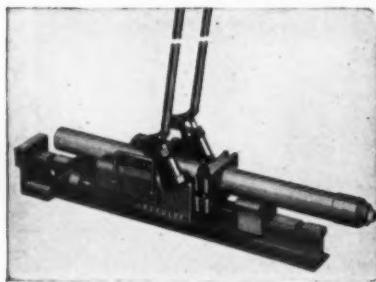
Every month many contractors are having the pleasing experience of making worth-while savings by using Greenlee Hydraulic Benders, Knockout Tools, Joist Borers, Bits, etc. Not only do they save money, but they do a better job. You, too, can profit by their use.



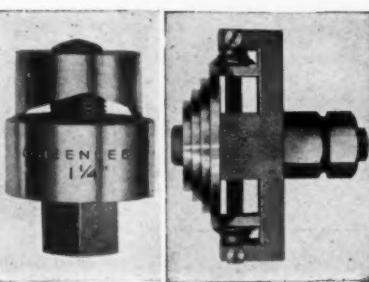
Above is the Greenlee No. 770-T Bender for thin-wall steel conduit. Same as No. 770, but with different attachments. Bends quickly and easily, without crushing. Complete forward movement of the ram makes full 90-degree bend. Will handle 1½, 1¾ and 2-inch conduit.



Above is the Greenlee Hydraulic Bender for rigid conduit. It is simple to operate, easily portable, and makes bends quicker and better than by other methods. No. 770 bends all sizes from 1½ to 3-inch. The large bender, No. 775, handles all sizes from 2½ to 4½-inch.



Greenlee No. 790 Hydraulic Pipe Pusher saves money on underground installation of pipe and conduit. Eliminates much trenching, back-filling, etc., and saves lawns and pavement. Easy for one man to operate. Will exert maximum pressure of 40,000 pounds on pipe clamp. Capacity for pipe from 1¼ to 4-inch.



Greenlee Knockout Tools enlarge holes for conduit quickly and accurately, without reaming or filing. Convenient to operate. Punches come in two sets. No. 735 is for ½, ¾, 1 and 1½-inch conduit, while No. 737 is for 1½ and 2-inch conduit. No. 740 Cutter will enlarge holes for 1½, 2½ and 3-inch conduit.

GREENLEE TOOL CO., Rockford, Illinois

..... Mail This Coupon To-day

GREENLEE TOOL CO., ROCKFORD, ILL.

Please send information on the following tools:

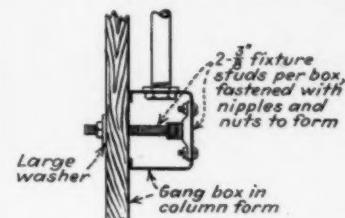
- Rigid Conduit Benders Thin-Wall Conduit Benders Pipe Pushers
 Knockout Tools Joist Borers Electricians' Bits Bit Extensions

Name Address

City State

My Jobber is 9-36

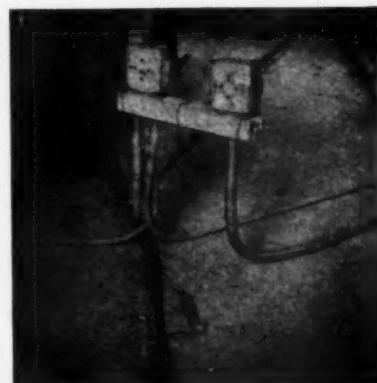
two ½-in. fixture studs for all switch boxes of 4-gang and larger sizes. Holes were bored through the ½-in. column forms at the exact horizontal centerlines of the various outlet boxes, and ½-in. nipples were made up through these holes to the fixture studs, their outer ends being provided with locknuts and large washers. After these nipples were



made secure on the outside of the form, the boxes were held in a rigid position during the pouring and tamping of the column concrete. Upon the removal of the concrete forms, the fixture studs were removed from the gang boxes.

Top of Concrete Outlet Anchorage

The rough concrete floors of a new federal building in San Antonio, Tex., were to receive a concrete fill and cement finish in which various conduits were to be run to wall outlets. To support these conduits where they stubbed up to their respective outlet boxes, Wright Brothers, local contractors, provided pairs of ½-in. by 2-in. wood strips, made secure with twisted stove wire.



Tie wires were made up at the outer ends and at the middle of these strips after these strips had been lined up against the underneath wall of the outlet boxes. Because the conduit runs provided rigidity in some directions, the strips added enough additional bracing strength to anchor the outlets for alignment in masonry walls.

Special TRADE-IN Offer



New X-RAY "Attraction Zone" REFLECTORS

Never before has it ever been so easy to modernize your show window lighting for greater sales • Be ready for the Fall buying season. Take advantage of the special Curtis trade-in plan. Make yours the store that gets the preference. In every community alert merchants have found that Curtis "Attraction Zone" lighting stops more shoppers and turns them into customers. Make your present outlets deliver 35% to 50% more light right where it does the most work. X-ray Reflectors make your displays sparkle with appeal . . . More people stop to look and more people come in to buy. If you have been wanting the advantages of this modern window lighting and have let cost stand in your way, here is your opportunity—this liberal trade-in plan makes it possible to put in modern window lighting at the lowest cost in our history. Don't delay another day.

OFFER GOOD FOR
LIMITED TIME ONLY... *Act Now*

Curtis Lighting

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Representatives in All Principal Cities

THIS OFFER GOOD THROUGHOUT THE UNITED STATES ONLY

THOUSANDS OF MERCHANTS WILL SEE THIS IMPORTANT ANNOUNCEMENT IN THEIR SEPTEMBER BUSINESS PAPERS
They Will Look to You for Adequate Stocks and Quick Delivery

ON SHOW WINDOW
LIGHTING....

For a
Limited Time Only

CURTIS LIGHTING, INC.

THROUGH ITS TRADE CONNECTIONS
WILL ALLOW \$100 EACH
FROM CURRENT PUBLISHED CATALOG PRICES
FOR EVERY OLD SHOW
WINDOW LIGHTING REFLECTOR
OF ANY AGE, MAKE, CONDITION, SIZE OR STYLE
TURNED IN ON THE PURCHASE OF
AN EQUAL OR GREATER NUMBER OF
NEW X-RAY GOLDEN ARMORED SHOW WINDOW
REFLECTORS (150-WATT SIZE OR LARGER)
(THIS OFFER COVERS NEW X-RAY REFLECTORS Nos. 400,
410, 420, 500, 510, 530, 900, 1010 ONLY.)



Note to

ELECTRICAL DEALERS

For each old show window lighting reflector turned in
by a purchaser of new X-Ray Golden Armored Show
Window Reflectors (Types Nos. 400, 410, 420, 500, 510, 530,
900, 1010 only) you are hereby authorized to allow to said
purchaser a "trade-in" value of \$1.00 from the current
published catalog prices; provided, however, that in
each transaction the total number of new reflectors
delivered is equal to or greater than the num-
ber of reflectors accepted for trade-in.

THIS WIREMOLD

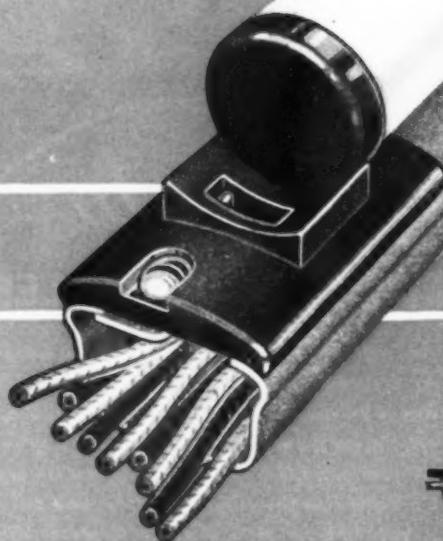
Simplifies Installation!

Makes it easy and simple to install any combination of 12" or 18" Lumiline Lamps, mounted end to end, or singly if desired

Lamps may be extended any distance in a continuous, unbroken series by the use of

WIREMOLD DUPLEX LAMPHOLDER BASES

Makes Lumiline Lamps



Showing Wiremold Lumiline Lampholder Base No. 1127A or B—a Duplex Receptacle for end-to-end mounting

Lay wired fittings in channel No. 1100B. Then turn two screws (with lugs) to lock each fitting into position. Cut Snap-on Cap No. 1100C into lengths to fit spaces between fittings, snap into position and job is done!

LUMILINE SYSTEM

Speeds up New Business!

Write to Wiremold Co., Hartford, Conn., for descriptive literature. This system sells on sight and pleases your customers

Showing how
a continuous,
UNINTERRUPTED
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is provided by use of

WIREMOLD DIRECTIONAL REFLECTORS

Practical and Usable!



Above illustrations show the DIRECTIONAL Reflector and Wiremold Lumiline Lampholder Base, mounted on Wiremold Light Strip. Reflector may be set in any one of five directions.

Showing Wiremold Lumiline Lampholder Base No. 1127C—a single receptacle for use at end of run.

Service Shop . . .

Practice . . .

Display Shelves for Outdoor Equipment

Customers who desire to purchase or rent special equipment from the Porter Electric Company of Minneapolis, Minn., may see the items they want, because they are kept in good



order and displayed in a series of steel wall shelves running along the full length of the sales room. The rear section of these shelves contains spotlights, floodlights and sound amplification equipment. The temporary installation of such equipment has become an important part of the company's business, in conjunction with its wiring and motor service shop departments. Heavy motors and controllers are displayed in a basement stock room.

Centralized Smoke and Fume Control

All cleaning, burning, welding and baking of apparatus is performed in one corner of the shop of the Excel Service Company, Chicago, Ill. This compact layout provides a reasonable amount of isolation for other production operations from annoying fumes, gases and dirt. A set of low

benches in the foreground are used for assembling apparatus and for taking apart equipment that is to be cleaned or for which the winding insulation is to be burned off. Clean-



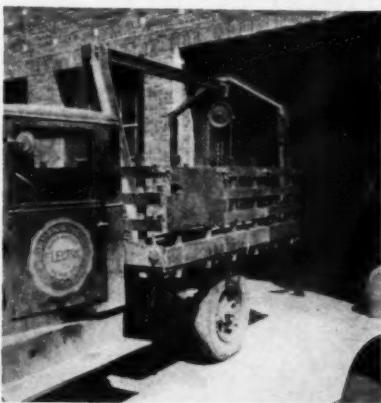
ing is done under pressure with a low-flash-point solvent within the 6-ft. by 6-ft. steel booth in the right background. Next to the left is a similar booth for welding operations. In the extreme background is the burn-off table with its forced-draft ventilated metal hood above. This vent also carries off fumes from the welding booth. Separate ventilation systems are used for the pressure cleaning booth, and for the baking oven (in the left background).

An overhead track extends toward the receiving dock and joins another track at right angles that serves the machine shop and winding departments.

One-Man Hoist Rack for Delivery Truck

Speedy one-man handling of heavy motors and other apparatus is possible with hoist equipment on the delivery truck of Hohman & Hill, Inc., Chicago, Ill. A one-ton chain hoist was assembled upon a rigid I-beam track and steel framework that projects 24 in. beyond the tail gate of the truck. Heavy equipment may be hoisted from the ground with this outfit, and set into the truck at any location by the truck operator, without having to employ heavy skids.

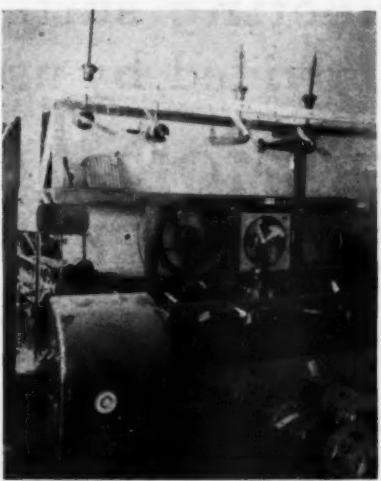
The chain hoist travels on a 4-in. by 4-in. by 10-ft. I-beam, which is supported by a framework made of 4-in. by 4-in. angle iron that is bolted to the truck bed. The rear bow-type



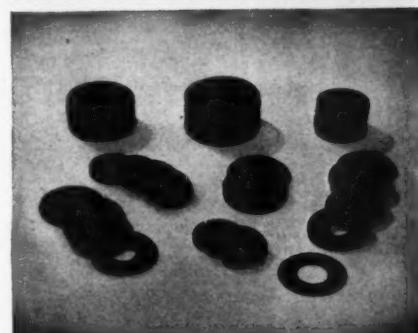
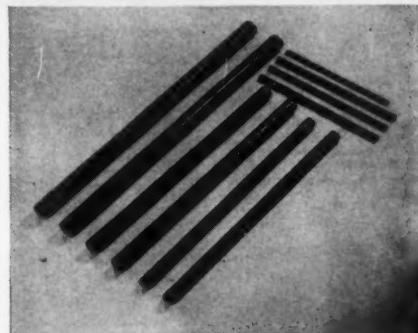
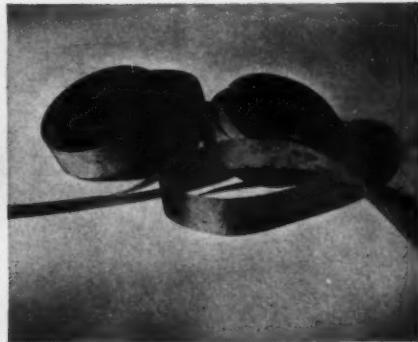
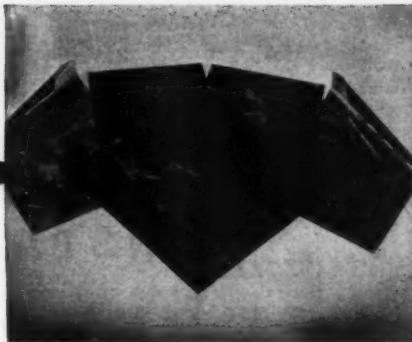
frame provides a clearance of 57 in. between posts. The bow is made of 3 in. by 2½ in. T-iron combined by welding with a 1-in. by 3-in. flat iron reinforcement member.

Fan Demonstration Rack

For demonstrating ventilating and aeroplane fans, the W. M. Smith Electric Company of Dallas, Tex., has provided a wall rack upon which such equipment may be safely mounted with little effort. An upper frame-work of 2-in. by 4-in. lumber is equipped with ¼-in. diameter J-hooks on 30-in. centers for clamping the hanger stems of aeroplane



fans to the back edge of the top member. Below this rack are adjustable headers for inserting and fastening several sizes of exhaust fans. Convenience outlets are provided all along the rack for plugging in the units that are on display.



DEPEND ON
GENERAL ELECTRIC MICA FOR

Uniform Quality

All Types for Your Requirements: Segment, Moulding, Heater and Flexible Mica Plates - Tapes - Composite Insulations - Tubing - Washers

The *uniform quality* of General Electric Mica is assured by scrupulous care in selection of materials and by highly exacting testing and inspection. In many cases the mica is x-rayed to safeguard against the presence of metallic particles . . . Your benefit is consistently *pure mica* . . . consistently *dependable insulation*.

The various types of G-E Mica Plate are bonded with Glyptal or shellac. Glyptal increases the resistance of the mica plate to electric arcs, to high temperatures, and to oil, and also creates greater density of the plate which results in improved electrical properties.

Get in touch with your nearest G-E Merchandise Distributor for complete information, or send the coupon today.

Section M-689, Insulating Materials Division
General Electric Company, Bridgeport, Conn.

I am interested in the following types of General Electric Mica:

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| Tubing | <input type="checkbox"/> | Washers | <input type="checkbox"/> | | |

Please send full information.

Name.....

Company.....

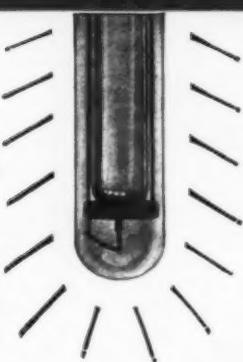
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City..... State.....

GENERAL ELECTRIC
INSULATING MATERIALS

APPLIANCE AND MERCHANDISE DEPT., GENERAL ELECTRIC COMPANY, BRIDGEPORT, CONN.

FOR HIGH EFFICIENCY MERCURY VAPOR LAMPS



The new mercury vapor lamps give more light per unit of current—reduce electric bills—Jefferson Transformers insure maximum economy.



Wall Mounted Type in neat metal case for mounting on wall or pole. Bottom is open for ready access to wiring compartment. Snap-on connections make it easy to match primary supply line voltage.

(Wall-mounted and fixture types are equipped with primary tap changing device and large primary and secondary wiring compartments.)



Fixture or Suspension Type for mounting between ceiling and lamp—with standard threaded coupling at each end.



Weather-proof Type in one-piece drawn steel case—interior compounded. Connections at bottom. Equipped with primary tap changing device.

Core and Coil Type—which fits in fixture. Vacuized, impregnated with final double varnish dip, bake.

INSTALL JEFFERSON TRANSFORMERS

Industrial plants, railroads, service stations, large stores—are finding the new high efficiency of mercury vapor lamps an immediate means of improving illumination and cutting electric bills in half.

Jefferson Transformers or Reactors for use with these lamps insure the expected full rated capacity and satisfactory performance. They keep the current demand low during the starting period and on continuous operation show low temperature rise. A special core has been designed, made up of very thin laminations of high silicon steel, annealed after punching to prevent ageing, and to insure cool operation. Scientific proportions of this core assure proper balance between copper and iron. The windings are machine built and completely insulated with varnished cambric and treated fibres.

Jefferson's long specialized experience in the development of transformers for mercury vapor and Neon luminous tubes, sun lamps, street lights and the like, makes possible the high quality special types of transformers and reactors required to insure the greatest lighting efficiency.

A complete line is available for use with both 250-watt and 400-watt lamps.—Write or mail coupon for Bulletin 361-MV and complete data JEFFERSON ELECTRIC COMPANY, Bellwood (Suburb of Chicago) Illinois. Canadian Factory: 535 College St., Toronto.

JEFFERSON

Mercury Vapor Lamp

JEFFERSON ELECTRIC COMPANY,
Bellwood, Ill.

Please send Bulletin 361-MV and complete information on mercury vapor lamp transformers.

Name

Address

City & State

Several tiers or steps of display shelves were provided below the fan rack to accommodate small motors.

Extra Thrust for Wheel Presses

The additional cost and space required for a heavy-duty hydraulic press presents a problem for the already crowded shop. Several service shops have satisfactorily overcome the lack of a heavy-duty press by inserting a 30-ton portable hydraulic truck jack in an inverted position beneath the upper cross-bars and the bed plate of their wheel press. Enough pressure was thus developed to remove shafts from rotors, and to remove stubborn slip rings or commutators. With such equipment on hand, it is also possible to make up heavy yokes and slotted draw plates for use with the portable hydraulic jack on jobs outside the shop. As a result of having this auxiliary equipment, quick jobs can be done in the shop or out on the job that would otherwise need to be transported to machine shops that have heavy stationary presses.

Speeding Up the Re-Mica Job

Conventional practice of filing new mica to the exact measure of each individual commutator bar has been reduced more than 50 per cent by the jig-saw V-slitting method. Where formerly the separate sheets of mica were first shellacked to their companion bar and then hand-filed to the exact bar size, taking from 60 to 90 minutes, by this method .035-in. mica for a 66-bar commutator can be V-slotted in about 20 minutes.

A standard vertical jig-saw may be equipped with a small bar jig or shelf and a high grade 22-tooth hacksaw blade. This type blade, it is said, will cut the V-slots for two 90-bar commutators before it needs to be replaced.

The sheet mica is first sheared to size from standard stock sheets. These bar-size pieces are then clamped in laminated bunches to one commutator bar as a pattern for sawing about twenty .035-in. pieces at a time. Because the V-slots are claimed to be always found uniform for the entire number of bars of one commutator, the multiple slotting method is considered to give a perfectly even fit of all the mica sheets against the commutator cone.

The conventional fitting method



This photograph illustrates the convenience and economy of using Appleton No-Thread Unilets. Cramped quarters are easy for Appleton No-Thread Unilets.

APPLETON NO-THREAD UNILETS are Time Saving Profit Makers

It is profitable to install Appleton No-Thread Unilets because of the ease and speed with which they can be fitted into any layout. The two simple operations of inserting the conduit and tightening the hexagonal nut reduce labor costs and make permanent installations. Malleable iron construction insures long life and satisfactory service because it combines strength with light weight. The cadmium coating resists rust and corrosion. In all types of installations Appleton No-Thread Unilets demonstrate their long wearing qualities.

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For a readier acceptance of your window-wiring bid, specify G-E time switches as control. The G-E monogram on millions of MAZDA lamps, on motors, refrigerators, ranges, and a thousand other G-E products, has made "General Electric" a name familiar in industry and the home. In your prospect's mind it stands as the symbol of reliability and accuracy.

The dependable Telechron clock motor, which is used in popular high-quality timepieces, makes your selling job easier. It is assurance to the prospect of the fine reliability of the G-E time switch.

Easy Installation

Your costs are less because G-E time switches are easy to install. Liberal spacing below the terminal block, five convenient knockouts for conduit connection, and connecting lugs simplify the wiring job and save workmen's time.

Low Maintenance

G-E time switches are always dependable. The extra-heavy silver contacts, reliable Telechron motor, and sturdy design insure customer satisfaction that will bring other installations and repeat orders for you. Specify G-E time switches and eliminate expensive profit-consuming service calls. You can wire one of these switches and forget it.

Be sure to write for your copy of Bulletin GEA-1427F on these general-purpose time switches. Address your request to the nearest office of General Electric Supply Corporation, Graybar Electric Company, or General Electric Company, Dept. 6A-201, Schenectady, N. Y.

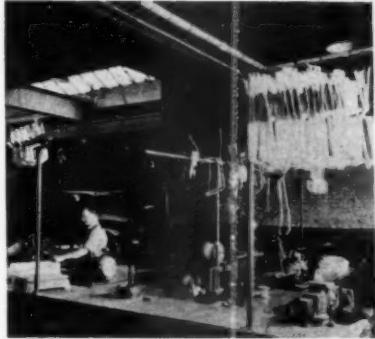
GENERAL  ELECTRIC

for adapting new mica to an old or a new set of commutator bars first of all requires a careful mechanic, one that can draw a file true and evenly. A hasty, sloppy or unskilled mechanic will either cut away part of the commutator bar or remove too much of the mica edge. In either case, this will cause the assembled bars to lack an evenly butted and flush set of mica insulation. The practice of shellacking the pieces of mica to their companion commutator bars causes the assembled commutator to present future difficulty if the re-insulation of a particular segment becomes necessary. The shellacked-on mica will be hard to remove from its companion bar.

The hard texture of high grade mica is found to make the use of a band saw impractical, due to the rapid dulling of the band saw teeth. Only perfectly sharp saws are found to give satisfactory results; therefore, a jig-saw designed for the use of short hacksaw blades permits quick and economical replacement to maintain a high grade cutting edge.

Top-of-Bench Coil Racks

Sets of coils are sometimes completed in the winding and taping section of the shop before being routed to the dipping tank and baking oven. These completed coils are placed out of the way on T-racks



in complete sets at the shop of Hohman & Hill, Inc., Chicago, Ill. Four such racks are provided on top of the coil department benches, each made up of a 48-in. vertical length of 1-in. pipe and two 36-in. long horizontal arms made of $\frac{1}{2}$ -in. pipe which forms the T. These $\frac{1}{2}$ -in. arms are made up to a 1-in. to $\frac{1}{2}$ -in. reducing pipe tee, and the 1-in. vertical pipe is fastened to the bench by means of a standard floor flange.

These racks also provide a handy place for storing coils out of the way that must be laid aside when a rush job is routed through the shop.

WHAT IS THE Sterling LITE-FLO STIPPLE?

It is an improved method of controlling light—modern as the streamline automobile—based on sound engineering plans and broad practical experience.

The Lite-Flo Stipple permits light to be directed to the merchandise trim without resistance—that is without being subjected to numerous cross reflections and unnecessarily wide angular dispersion.

Through improved light control this outstanding Sterling development makes it possible to save light old style reflectors waste and concentrate it on the merchandise trim—the Front-Line of Sales Appeal.

Merchants and display men are interested in more effective lighting with the same operating cost. You can give it to them with **Sterling Lite-Flo Reflectors!**

These remarkable reflectors intensify light on the merchandise trim line—the Front-Line of Sales Appeal.

Through the **Sterling Lite-Flo Stipple** and other design improvements light that old style reflectors waste on the sidewalk and upper window sections is concentrated on the merchandise trim—the point first to meet the eye and which must attract and hold attention.

So remarkable is the intense Front-Line Lighting afforded by **Sterling Lite-Flo Reflectors** that many contractors are using it effectively as an entering wedge to open new accounts. Write for complete sales literature.

Sterling Engineers furnish detailed plans covering Front-Line Lighting of show windows without obligation.

The **Sterling Line of Silver-Plated Glass Reflectors** covers every requirement of display lighting in show windows, display cases, refrigerators, etc. Complete catalog on request.



REFLECTOR & ILLUMINATING CO.
1435 West Austin Ave. Chicago, U. S. A.

Lighting

Data

Suggestions for Luminous Decorations

The growing popularity of decorative lighting for social and festive occasions places more and more importance on the need for the creation of practical luminous display material.

The illustrations, Fig. 1, show a new idea with interesting possibilities. It is a simple device consisting of a suitable base, two design shields, two receptacles for colored lamps

and a simple shield for the front of the lamp.

The design shields may be painted in flat white. By the use of lamps of contrasting or harmonious colors in the receptacles, the luminous design stands out with unusual appeal because of its brilliance and beauty of color. Actual designs may be painted on the shields, although the nighttime appearance is extremely fascinating with the flat white background. If color is desired for daytime effect, the shield may be

tinted according to the lamp color.

This principle is adaptable to designs of any size. For the average home where exposed lamps are used, the larger design shields should not be more than 15 in. square.



Application of the two designs

Decorations for outdoor use may be considerably larger than those for interiors; this, however, will require the use of more and perhaps higher wattage lamps. If gas-filled lamps are to be exposed to the weather, they should be protected.

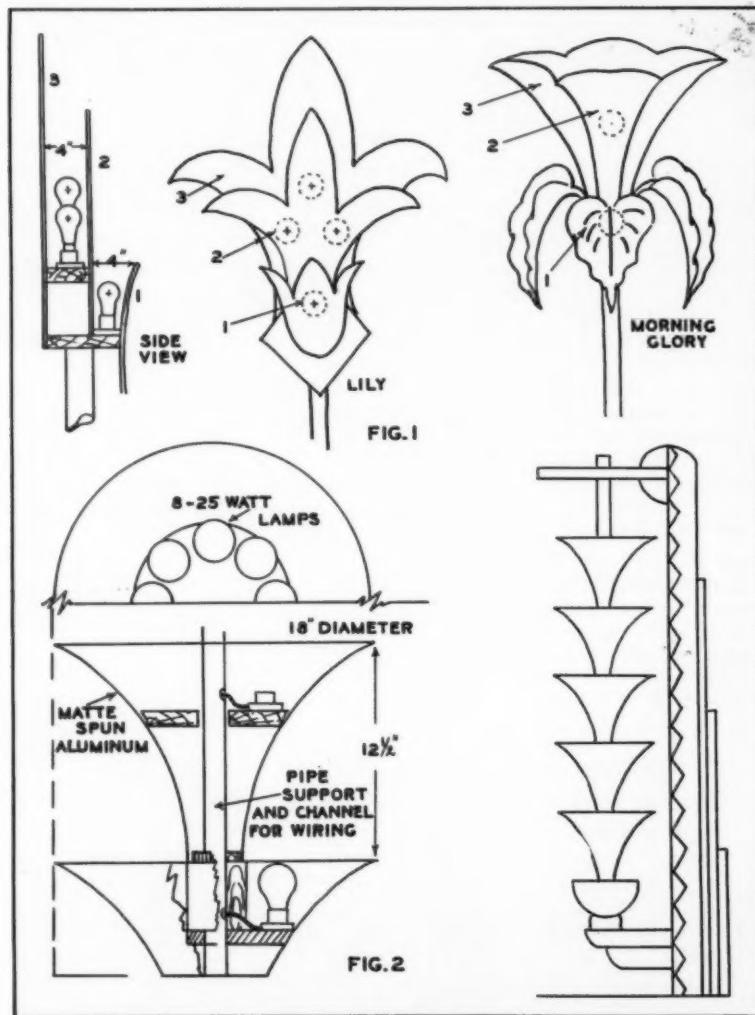
Another suggestion, which is shown in Fig. 2, may be used to flank entrances or as a general decorative piece. The plan for the unit shown is of such a size that it might be applicable to the sides of a large entranceway.

Lighting Recommendations for Fall and Winter Sports

By Dean M. Warren
General Electric Company
Nela Park Engineering Dept.
Cleveland, Ohio

Football: Satisfactory lighting for high schools and small colleges may be accomplished by using wide beam projectors or large open type reflectors. Units should be equipped with 1000 or 1500-watt lamps and mounted on poles 40 to 50 ft. high. Ten poles with 4 to 6 units are recommended, five on each side. Poles should be located about 15 ft. from side lines.

Twenty footcandles recommended for medium size stadiums. Medium beam floodlighting projectors, equipped with 1000 or 1500 watt lamp recommended. Units, 12 to 20



Construction details of two designs



Catalog No. 76

Above is Catalog No. 76 . . . 30 amp. 2 Plug fuse, furnished with fibre dead front plate. Large illustration at top is Catalog No. 83 . . . 30 amp, 2 N.E.C. fuse. Catalog No. 73 shown closed.

The NEW COLT-NOARK 100th ANNIVERSARY CATALOG is ready. Contains full data on new Pony Switches—as well as all Colt-Noark Products . . . send for your copy.

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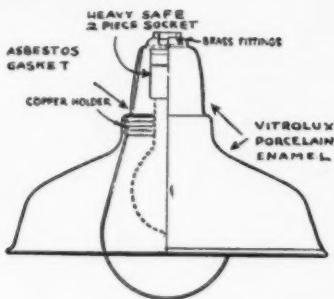
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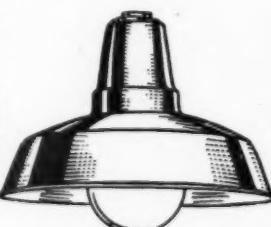


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in number, should be located on towers, 70 to 90 ft. high. Towers are located three on a side and mounted on back of, or behind stadium.

Hockey Rinks: Ten footcandles recommended. Obtainable by locating floodlighting projectors or open type reflectors on 25-ft. poles and equipping them with 1000 or 1500-watt lamps. Poles should be evenly spaced, four per side, and located outside rink in order to prevent slush and water from dripping on ice and causing rough spots.

Toboggan Slides: Two footcandles recommended. Lighting accomplished by locating a 1000-watt narrow angle projector every 100 yards along sides of runway, with beam directed along runway. If there are sharp curves, a projector should be placed on the inside of the curve so as to light curve bank. Another projector should be provided above knee of curve to light straight-a-way beyond curve. Place this projector so that it does not constitute a hazard should toboggan jump track.

Why Must Daylight Be Supplemented?

Casual thought may lead to the conclusion that daylight is all sufficient and need not be supplemented by artificial lighting to provide good seeing conditions. The fallacy of this conclusion is apparent when foot-candle measurements are made. On a bright, sunny day in midsummer, the amount of daylight available at the window is in the neighborhood of 100 footcandles, while at a distance of 20 ft. from the window the illumination has dropped to the eyestrain level of 5 footcandles.

Bright sunny days, however, are not the rule. According to the 1934 edition of the Statistical Abstract of the United States, the percentage of possible sunshine throughout the forty-eight states amounts to only 60 per cent. This survey reveals that even though daylight is used to its practical limit, it must be supplemented more than 40 per cent of the time.

Mercury Vapor Sales

There have been about 30,000 400-watt mercury lamps (Type H-1) bought since January 1, 1935. Records as of April 30, 1936, show 243 installations where ten or more mercury lamps are installed. While the average number of lamps per installation is 63, there are over 2000 lamps in one of these installations.

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GEORGE C. RICHARDS, LICENSOR'S AGENT
155 EAST 44th STREET, NEW YORK CITY

Code Chats

Questions and answers relating to the interpretation of the National Electrical Code ...

Conducted by F. N. M. Squires

Chief Inspector New York Board of Fire Underwriters

Non-Combustible and Fire Resisting

Rule 5004-b requires transformers to be contained in an enclosure of non-combustible material, and 5004-e states that if the transformers are filled with a liquid that will burn, the enclosure required by (b) will be fire-resisting.

What is the difference between a vault of non-combustible and one of fire resistive material?

While there is, of course, a difference in the definitions of non-combustible and fire resistive, the words in the two rules quoted above have the same meaning. The construction required to satisfy both rules is contained in rule 5006 which deals with the construction of the transformer vaults.

Protection From Mechanical Injury

If wires are run in flexible conduit or armored cable, would they be considered as protected from mechanical injury?

It seems that 908-h would consider them so protected, as it states, that if the grounding of wire system is less than No. 4, and run in cable armor, it may be used as the grounding conductor for conduit, etc.

908-n states that if the grounding conductor is smaller than No. 4 and if within 7 ft. of floor, it must be protected from mechanical injury by rigid conduit, or other approved means.

Would armored cable be approved means?

What would be an approved means for protecting conductor from mechanical injury depends upon the nature of the injury to which it might be subjected. In an ordinary house or building, the armor of armored cable would afford sufficient protection.

In most cases, electric metallic

tubing as well, would do and very often a wood guard strip would be sufficient. But in some locations, where heavy objects are apt to come into contact with the grounding wire, rigid conduit would be necessary.

Protection for Armored Cable

Is there any place in the Code that would prohibit armored cable being run outside a partition from one floor to another, without being protected from mechanical injury?

I could find nothing that prohibited this, yet 505-g seems to require protection in attics.

Armored cable must, wherever installed, be not subject to mechanical injury. That is why 805-c requires cable to follow the surface wired over unless protected by running or guard strips.

Because of the custom of storing trunks, boxes, etc., in accessible attics, armored cable in such locations must be protected. Of course, where attics are inaccessible no such protection is needed.

Use of Different Insulations

With an allowable current carrying capacity (Sec. 612) of No. 6 R. C. wire as 50 and No. 8 bare wire as 50 amp., will it be permissible to use two No. 6 insulated and one No. 8 bare for service entrance conductor to 44.3 amp. load?

Such an installation should not be approved. The safe carrying capacity of a conductor has been set in accordance with the amount of heat generated in that conductor by a certain amount of current and the current is limited to the maximum amount which will not injure the insulation of the conductor.

For instance, a No. 8 rubber covered wire has a limitation of 35

amps., and No. 6 rubber covered of 50 amps., while for slow burning insulation or bare wire the allowance for No. 8 is 50 amp., and for No. 6 is 70 amp. because the heat from those amounts of current will not injure the insulation nor be otherwise hazardous.

However, if we place No. 8 wire, bare or insulated, in the same enclosure with rubber covered conductors and then subject it to 50 amp., the heat developed will be sufficient to injure the rubber insulation on the other wires.

In the case cited in the question the three wires should be of the same size, viz. No. 6. Then under the provisions of rules 402-d, 403-h and 404-d, the grounded service conductor may be bare.

Oversize Motor Circuit Conductors

We have a branch circuit feeding a group of eight $7\frac{1}{2}$ hp. 550-volt motors. Each motor has a magnetic control and overload relay. The size of the branch circuit from the cut-out panel to these motors according to Table 1, Section 808, calls for No. 2 wire. The taps coming down to each of the magnetic controls according to 808-b-1 could be No. 10 wire or smaller.

Under exception 1 of 808-b-2, the motor branch circuit conductors to the motor running protective device have either (a) the same carrying capacity as the feeder or (b) at least one-third the current carrying capacity of the feeder with the minimum in accordance with 808-b-1, the conductors to the motor running protective device in the latter case being not more than 25 ft. long and being suitably protected from mechanical injury. In this case the No. 10 is in $\frac{3}{4}$ -in. conduit and the run is approximately 8 ft.

We would like an interpretation of these two paragraphs. We believe we are amply protected with No. 10 wire in accordance with the Code. No. 10 wire has a carrying capacity of 25 amps. which is more than 125 per cent of the $7\frac{1}{2}$ hp. full load current which is approximately 9 amp. according to Table 5, Section 808.

Now, we had some No. 4/0 wire and instead of using the No. 2 which would be large enough from the junction box back on the home runs, we want to use up the No. 4/0. This will also take up any drop in the lines and the conduits are in of sufficient size, $2\frac{1}{2}$ -in. for these 4/0 cables. But according to the exceptions to 808-b-2, if the interpreta-

3

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tion is taken that the branches from the line to the control box must be one-third of the size of the feeder, we would have to use one-third of the size of the No. 4/0 which would be approximately No. 4 wire for the taps.

Also we have some No. 1/0 that we want to use for the home runs. If we followed the exception ruling and used one-third of the No. 1/0 capacity, which would be around 41 amp., we would use No. 8. But the only reason we are using the No. 1/0 or the No. 4/0 is because we have it on the job, having pulled it out of the old conduits.

From a practical standpoint and abiding by 808-b-1 the No. 10 is of sufficient size, but we would like to get an interpretation.

As pointed out the group of eight 7½ hp. 550-volt 3-phase motors would require a feeder at the smallest of No. 2 conductors which can be fused at up to 90 amp. The motor branch circuit should be not smaller than No. 14 with motor branch circuit fuses of not over 30 amp. and motor relay setting at not over 15 amp.

It would satisfy the Code requirements to use No. 4/0 wire for the feeder in place of the No. 2, in order to avoid excessive drop, or for any other reason, but the size of the fuses must remain the same; that is not over 90 amp. The reason for this is that these fuses are required to protect, not only the motor feeder conductors but also the motors.

Then with 90 amp. fuses installed to protect the feeder, conductors having a carrying capacity of one-third of this, or 30 amp. capacity, could be used for the motor branch circuits. These, then, could be No. 8.

But again, even with No. 8 wire or larger for the motor branch circuits the branch circuit fuses could not exceed 30 amp., nor the motor relays 15 amp. in order to insure proper protection for the motors.

Boxes for Out-of-Doors

When an outlet or cabinet box such as an 8-in. by 10-in. by 4-in. cabinet box with flange cover, is used out of doors does it require a gasket? Meter cabinets used by power companies do not have gaskets, sealed covers or doors, and are considered weatherproof.

For use out of doors an outlet or cabinet box should be of the ap-

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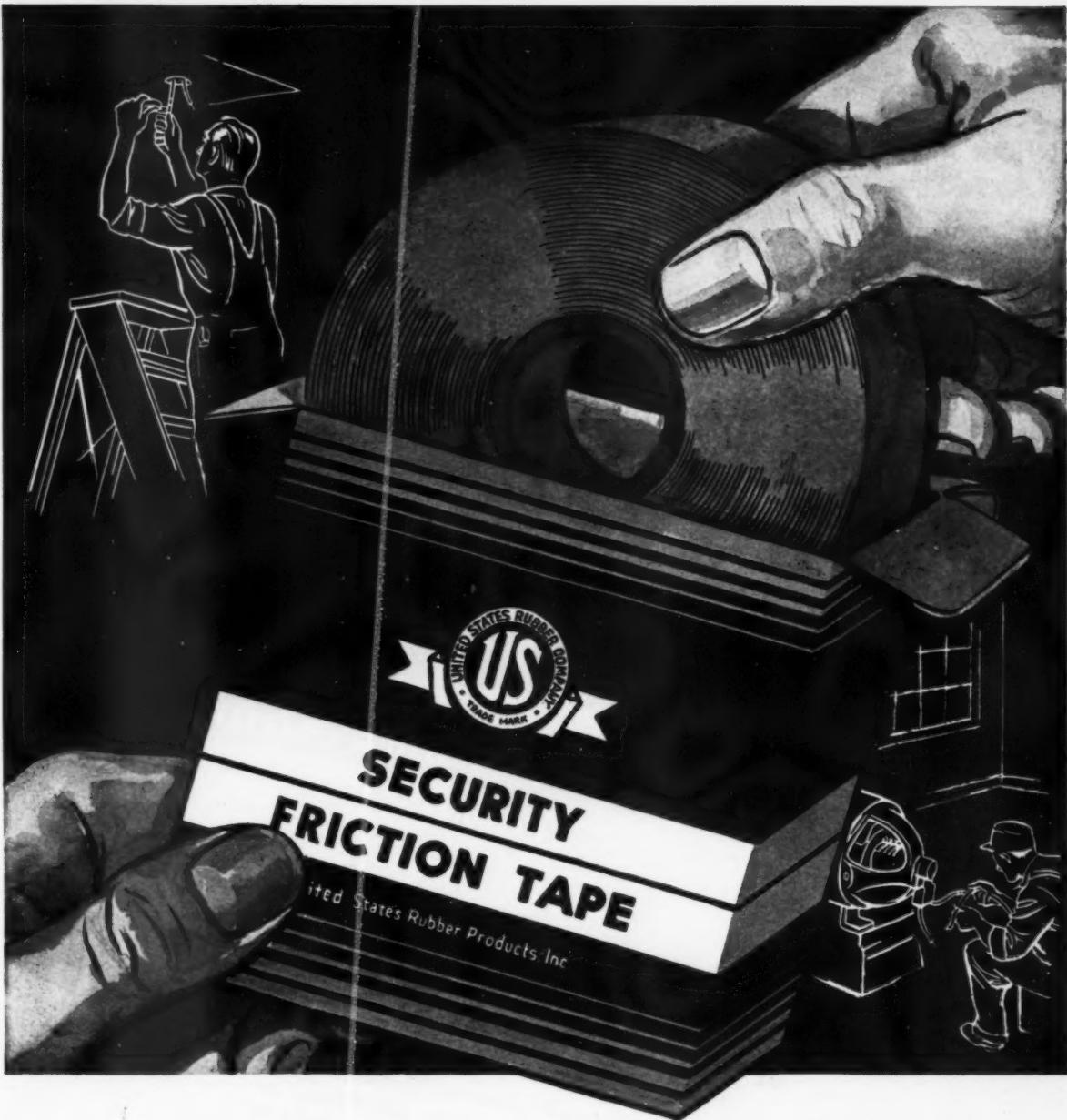
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through ADEQUATE WIRING

Everyone agrees that adequate wiring will

- (a) Increase owner-satisfaction through greater comfort, safety, and service.
- (b) Increase sales and profits of electrical contractors through the installation of more materials and equipment.

The burning question, therefore, is

HOW CAN ADEQUACY BE SOLD?

The October Convention Issue of ELECTRICAL CONTRACTING will carry, in addition to special Convention features, a 16-page section on the subject of adequate wiring. This section will include:

- | | |
|--|--|
| (1) Relation of cost of wiring to adequacy | will be available and how to secure it |
| (2) High cost of cheap wiring | a—Inspectors |
| (3) The bad effects of inadequate wiring on Lighting, Heating, Power | b—Leagues |
| (4) Relative cost of adequate wiring | c—Utilities |
| (5) Will the public buy adequate wiring?
a—Residential | d—Wholesalers |
| b—Industrial | e—Manufacturers |
| (6) Symposium on various kinds of cooperative effort that | f—Contractors |
| | g—Architects |
| | h—Builders |
| | i—Home Service Women |
| | j—Wiremen |
| | k—Dealers |
| | l—Industry Employees |

Watch for this issue, and use it as a sales help for increasing profits through adequate wiring.

ELECTRICAL CONTRACTING
330 West 42nd St., New York, N. Y.

OF THE BUILDING DOLLAR, SELL ADEQUACY!



Lamp Guards by MCGILL

Lamp Guards prove to be an economy by saving breakage, theft, relieving eye strain, reducing accidents, spoilage and increasing production. Every concern can use them. Profitable sales volume is possible with the complete McGill Line.

A Type for Every Requirement—Send for Catalog 34

The Loxon—has the lock feature—stopping theft. Made with or without reflectors, for regular or Mill Type lamps.

Rubber Handle Portables—a line of portables with ten unusual selling features. Users like them.

Bulldog—strong, sturdy, copper plated cage rigidly fitted to hardwood handle, with Lever or Keyless socket.

Crescent—a light, strong guard, made of steel rods fastened to metal ring, and without socket.

Crescent Tubular—an ideal slender guard, 2-inch diameter, for tubular lamp.



Safety Vaporproof—useful around gases or inflammable materials. Heavy steel frame.

Protector "O"—a low cost, open bottom, heavily tinned stationary guard, for 25-60 lamps.

McGILL MANUFACTURING CO.
Electrical Specialists of Quality
ESTABLISHED 1864
VALPARAISO • INDIANA
Box No. 670



proved weatherproof type, which in general, is a cast box with threaded hubs into which conduit may be screwed. The pressed steel type of box is not approved for out of doors, unless, as in a cutout or switch cabinet, the knockouts are below the line of the lowest live part within the cabinet and then there must also be drainage at the bottom of the box.

The type of box mentioned by our correspondent would not be suitable for use out of doors. Meter cabinets for use out of doors should, of course, be of the weatherproof type. If a box without a gasket has been approved as being of the weatherproof type, no gasket should be used, because the use of a gasket in such a case would upset the weatherproof features of the box.

Why No Fuse in Neutral

Please explain why no fuse is allowed (Rules 2001-e) on the grounded wire of a 2-wire branch circuit.

If fuses were placed in both wires of a grounded 2-wire circuit and the fuse in the grounded wire blew out or was removed, the circuit would still be alive to ground which might cause injury to some one who thought that the whole circuit was dead.

Neon Tube Receptacle or Bushing

Rule 3812-a states that electrode receptacles or bushings shall be used wherever electrodes enter a trough.

It seems that Rule 3811-a makes above rule optional, as it states, "the electrode may project within the enclosure and be separated from grounded metal by a minimum of 1½ in. of air."

In other words it seems that if the metal of sign is 1½ in. from electrode, a bushing is not needed.

Is this the case?

Rule 3812-a requires the use of either a receptacle for the tube electrode or a bushing.

Rule 3811-a requires that the tube terminals project within the enclosure or otherwise be properly protected or enclosed.

If the bushing is used in place of the electrode receptacle, then the terminals or other live parts must be supported so as to keep them at least 1½ in. away from other metal.

COMPARE

the BULLETIN 709

SOLENOID STARTER

CHECK LIST OF STARTER DESIGN

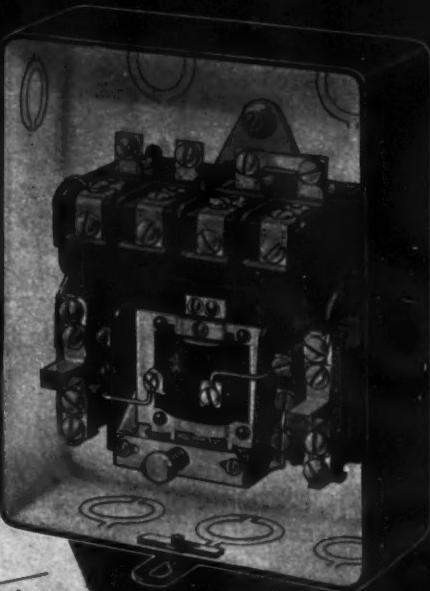
Feature	Allen-Bradley Bulletin 709	Ordinary Clapper Switch
SIZE	Very Compact	Big
WIRING SPACE	Generous	Too Small
BACK PANEL WIRING	None	Yes
INTERIOR FINISH	White	Black
CONTACTS	Silver Alloy	Copper-to-Copper Should be filed regularly
CONTACT MAINTENANCE	None	Clapper
MAGNET CONSTRUCTION	Solenoid	One or more liable to stick
BEARINGS	None	Three or more - Possibility of breaking
JUMPERS	None	Yes - Has open arc hood
DANGER OF FLASHOVER	None - Arc is completely enclosed	

Bulletin 709 solenoid starters are furnished in seven standard enclosing cabinets to meet every operating condition. Write for descriptive literature.



Bulletin 709 solenoid starters are made in three sizes:
 Size 1—5 hp, 230 v.
 7½ hp, 440-550 v.
 Size 2—15 hp, 220 v.
 25 hp, 440-550 v.
 Size 3—30 hp, 220 v.
 50 hp, 440-550 v.

Recommended: Bulletin 709 Solenoid Starter
 it requires no contact maintenance



ALLEN-BRADLEY
SOLENOID MOTOR CONTROL

Allen-Bradley Co., 1307 S. First St., Milwaukee, Wis.

ELECTRICAL CONTRACTING

S. B. WILLIAMS, Editor

Larger Loads

RECENTLY a complaint was received from a manufacturer of unit air conditioners that restrictive wiring regulations were holding back the sale of his units. He had a $\frac{1}{2}$ -hp. unit that he wanted to plug into a circuit as you would a portable lamp.

Such devices that would run all day long in the summer months should have a circuit of their own, but the emphasis we have placed upon the convenience of electricity has led many people to believe that anything could be plugged in anywhere.

Moreover, with such devices coming should we not again revise our ideas of service entrance sizes? In thinking about larger entrances we have too often stopped with the consideration of a range load. We must learn to think that many other large load devices are coming and prepare for them rather than wait until a new device bobs up.

—♦—

Profitless Prices

REPORTS from various sections of the country indicate that the volume of electrical construction for the first half of this year was approximately 51 per cent greater than for the same period last year. The prices at which this work is being taken, however, reflect little if any improvement, being still at depression levels.

Apparently the long period during which work was almost non-existent has made the contractors so ravenously hungry for work that they are willing to take it at almost any price. In the small jobbing work, which has increased very greatly during the past few months, there is the competition of the new one-man contractor who is satisfied to get wages. This competition has even

made this class of work, that ordinarily is most profitable, in many cases a profitless activity.

Of course, this mad price scramble has not improved the character of the work or the adequacy of the job. In one large section, the men wiring homes are required, according to reports, to put in twenty-five outlets per day. In another case, the work is sub-let to the wiremen. Such practices, of course, result in workmanship for which the public, before long, will have to pay dearly.

Unfortunately there is little that can be done to correct such business practices. The best control is probably strict inspection. Then, if a contractor wants to go broke taking work too low, he at least must do safe work.

Contractors can cooperate with their inspection departments by reporting any work that looks as though it was being bootlegged. Thus, by making an effort to have every piece of electrical work inspected, offenders will soon realize that they cannot make up losses by substandard work.

—♦—

Shop Labor Management

WHILE it takes four years to train an electrical mechanic, it generally takes anywhere from six to ten years to train a good all-round motor repair mechanic. This is a rather long time to invest in training a worker especially when there is no assurance that he will not leave either to start in business for himself or hire out to someone else. Is it worth-while? Many shops will say "Yes" and point with pride to the men who have been on their payroll for a great many years. Others, however, are questioning the advisability of providing men with a broad training covering every phase of service work. Instead they are advising specialized training because it takes less time and does not create a competitor at the first opportunity.

Precedent for this kind of training has, of course, been provided in our large manufacturing industries. Men, instead of being all-round machinists, are specialists in the operation of one machine or tool.

However, it must be remembered that this has been made possible only through line operations. How many motor repair shops are large enough to be able to offer steady employment to mechanics who know only one phase of the work?

At any event, it is an idea that offers an op-

portunity for some practical thinking. Labor is the most important item of cost and, with growing competition, it becomes increasingly important that more careful attention be given to the whole subject of labor management in motor repair shops.

One of the big markets for repair work is getting away from the established shops and going to specialists. We refer to fractional motors. Established shops doing large work would like to take on this work but they can't see their way clear because of costs. A study of labor requirements might show a way to handle this work profitably. How many shops, for instance, have explored the possibility of employing girls or boys for fractional motor rewind work?

There are many other angles to the subject of labor management in shop work. A careful study of this subject will supply the right answer to many of the competitive problems. Price stabilization is helpful for a while but eventually the accepted price will be the one dictated by competition with low costs.



Discouragement

THESE are times to try men's souls; to keep one's head and not be panicky at the first smell of a job. Starving men who do not restrain themselves when they first get food get sick and that perhaps is what is happening to electrical contractors today.

At any event, the competition situation has become so bad that more than one contractor, who in the past have done more than their share to promote cooperation, have turned their backs on all association work. They frankly state that they can see no use in trying to help educate competitors who do not want to learn.

The loss of such men to local association work is really serious, not only because of what they could do but because by their example others are influenced to stay away.



Wiring Sales

REPORTS each month from electrical leagues that are selling Red Seal wiring are most suggestive of the possibilities before the industry whenever it shall decide to promote adequate

wiring on a national scale. One man in Denver sold 358 additional outlets in June, while in Milwaukee one man in the last few months was responsible for 2,144 additional outlets on 248 new jobs. Likewise the cooperative effort of the South California Edison Company has resulted in 167 Red Seal homes in three months with one hundred more pending.

These men are raising the standard of wiring almost bare handed. The amount of publicity which the leagues are able to put back of them is still extremely limited. Think what might result with a few hundred such men backed up with a national and local educational campaign. Think of the possibilities if the wiring for every new job of any consequence was studied before the contract was let, if every architect, builder and owner was personally educated to the advantages of better wiring. Nor should one forget that in selling adequate wiring the salesman must of necessity sell the use for the wiring, thereby killing two birds with one stone.

Adequate wiring can be sold. These league field men are ample evidence of that fact.



Convention Program

A NEW idea in electrical contractors' convention programs will be tried out at Atlanta next month when the N.E.C.A. meets. Ordinarily the convention sessions are largely taken up by invited speakers with little time available for discussion by members either of the addresses or of other topics. Frequently the officers of the association have been criticized for not giving the members sufficient time to bring up for discussion things that had been bothering them.

Accordingly, this year the convention has been given over almost entirely to the members. Only four outside speakers have been scheduled so far. The members have been asked to notify the program committee what they wanted to talk about at the convention and it is from these talks that the committee expects to be able to arrange a program for two of the sessions.

If the members do voluntarily cooperate with the committee and if the representation on the program shows wide geographic diversity, the officers of the association should find therein guidance for the future activities of the organization.

SELLING begins when

Longwood Towers

Boston, where Anaconda Service Entrance Cable made possible the replacement of gas cooking by 241 electric ranges.

This is the Service Entrance Cable (Anaconda Type SCF) the use of which enabled the owners of Longwood Towers to wire economically for all-electric cooking. This cable is available with 2 or 3 conductors as required for the specific job. Other types are available.



An
from

26441

the customer says "No"

The story of how the contractor, utility and inspector cooperated in selling kitchen modernization to the owners of Longwood Towers

Kitchen modernization was the solution to the competitive rental problem of this established real estate development. But . . . cost of range wiring barred its possibilities. The Electrical Industry, however, refused to be beaten. Working together, the contractor, utility and inspection bureau designed a system of wiring to

overcome the cost problem. In Service Entrance Cable they found the solution to their difficulty . . . Anaconda Service Entrance Cable, of course. For experience with other types of small dwellings, single and multiple, had proved the ability of this tested product to serve on jobs where cost had been the obstacle. And here's why!

- ... It may be fished through restricted spaces in existing structures
- ... It minimizes wall cutting and patching
- ... It permits the making of sharp bends
- ... It speeds installation and keeps outage at a minimum

The trend toward kitchen modernization, increasing steadily, is creating new business opportunities for the electrical contractor. Anaconda Service Entrance Cable has long been

used with outstanding success for usual service entrance requirements. In addition, it now opens the way to more jobs for you from the large and profitable apartment house market.

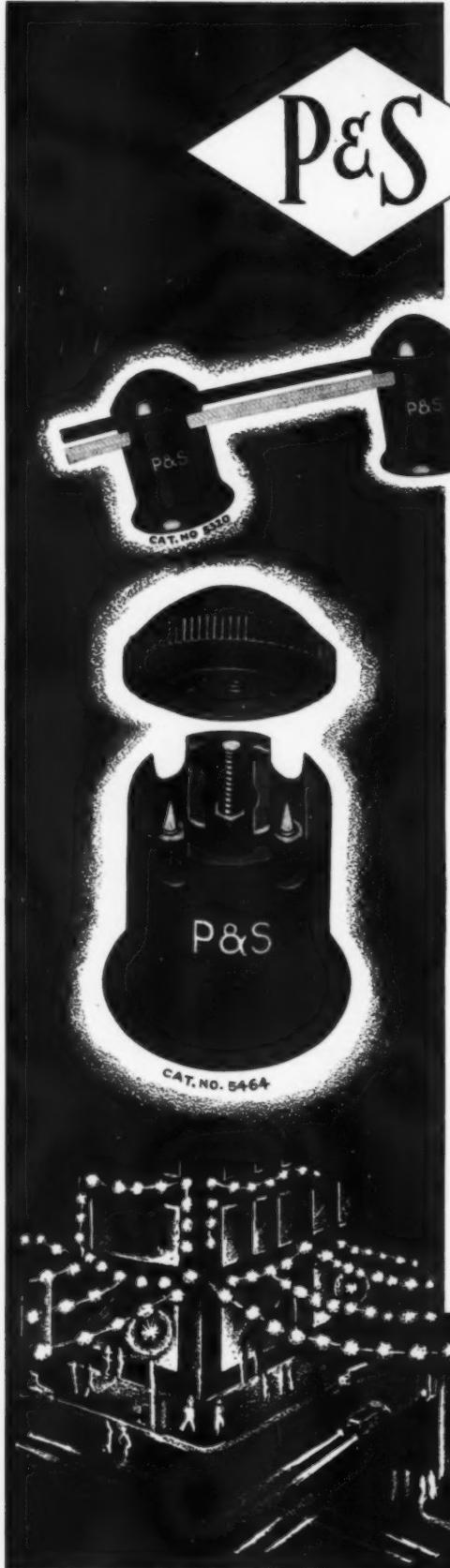
ANACONDA WIRE & CABLE COMPANY



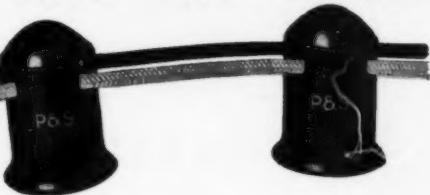
General Offices: 25 Broadway, New York

Chicago Office: 20 North Wacker Drive

Sales Offices in Principal Cities



Decorative LIGHTING MATERIALS



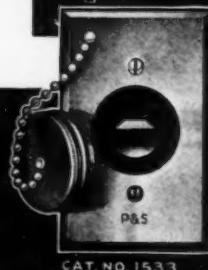
P&S Ready-wired Streamers and Pin Type Sockets are two profitable items for decorative lighting work. P&S 5320 type Ready-wired Streamers are equipped with brown bakelite weatherproof sockets—supplied in any length up to 500 feet—with any spacing of sockets desired. Completely wired—ready for immediate use. Suitable for either indoor or outdoor installation.

Cat. No. 5464 bakelite socket for temporary work is designed so stripping, soldering, or taping of wires is not necessary. Sharp pointed terminal pins pierce insulation and make positive contact with wire. Socket cap screws onto body, holding wires securely in place.

Your request for bulletin 1995-C will bring complete listings and data—write for it today.

PASS & SEYMOUR, Inc.
Syracuse, N. Y.

- Outdoor Flush Receptacle for holiday lighting, portable appliances, etc. Plate and screw cover are cadmium finished to prevent corrosion. Thoroughly weatherproof



CAT. NO. 1533

N.E.C.A. News..

Material for this department is supplied
by the headquarters staff of the

National Electrical Contractors Association

420 Lexington Avenue, New York, N. Y.

President E. N. Peak 1603 West Main St. Marshalltown, Ia.	Vice President Louis Kalischer 17 Bergen St. Brooklyn, N. Y.	General Manager Laurence W. Davis 420 Lexington Avenue New York, N. Y.
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NECA Pledge of Cooperation

The Pledge of Cooperation which was adopted by an almost unanimous vote by mail ballot of N.E.C.A. membership as a qualification for membership, automatically pledges each member to maintain the qualifications or to withdraw from the pledge only by giving notice in writing to the Association whereupon membership shall cease.

The form of the pledge and its adoption by the membership as a qualification for membership makes it unnecessary that each individual actually sign the pledge. Each member of the Association in his application for membership signs the following agreement:

"We agree, if elected to membership, to abide by the Constitution and By-Laws of the Association, and all rules and regulations of the Association now in force, and that may be regularly adopted."

In the revision of the N.E.C.A. Constitution and By-Laws which will be submitted to the convention at Atlanta in October, the Pledge of Cooperation is included as a section covering membership qualifications.

NECA Appoints Committee on Adequate Wiring Promotion

The following five electrical contractors, representing commercial, industrial, residential, rural and line construction wiring fields, have been appointed by President Peak to serve as N.E.C.A. Committee on Adequate Wiring Promotional Program:

Robt. W. McChesney, Washington,
D. C.

Allan Coggeshall, New York, N. Y.

J. M. Richardson, Roanoke, Va.

Walter W. Whiffen, White Plains,
N. Y.

Earl N. Peak, Marshalltown, Ia.

A joint industry committee also has been at work for the past year in the preparation of a Handbook of Wiring Design, which is essentially the preparation of adequate wiring standards.

It is felt that there is definite need for a study of ways and means for promoting the actual adoption and use of such adequate wiring standards, to

provide for adequate wiring capacities to meet present and future utilization requirements, and to overcome the competitive and other obstacles which hinder this wiring development. The purpose and scope of the project undertaken by this new N.E.C.A. committee has been defined as adequate wiring promotion.

The first meeting of this committee will be held in the N.E.C.A. headquarters office in New York City on September 10 and 11.

Denike Appointed to Asa Sectional Committee

Robert E. Denike, New York City, has been appointed to represent N.E.C.A. on the A.S.A. Sectional Committee on Standardization of Scheme for Identification of Piping Systems, sponsored by the American Society of Mechanical Engineers.

Simplified Business Record

The following interesting letter was received at N.E.C.A. headquarters on August 19th from Harry Ryan, President, Ryan Electric Company, Sioux City, Iowa:

"We started in May first using the N.E.C.A. Simplified Business Record and are very much pleased with the results. As we become more familiar with the forms it is easier to keep up to date and the work becomes largely routine. Monthly balances are not hard to get and the contractor has, at all times, a picture of his business before his eyes (as things are, right now, that will keep him from getting the swelled head).

"To my mind, the part of the record that has a very definite value is Job Analysis, columns 45-48. To keep this properly, one is forced to cost every sale and will have to know the gross profit (or loss) on each transaction. Theoretically all contractors are supposed to do this with whatever book-keeping system they use. As a matter of fact, we know that unless one uses something like this system which forces him to cost his jobs, he will get careless and guess work slips in. The use of the Simplified Business Record, intelligently applied, will largely do away with guess work about costs and show any contractor, at all times, where he stands.

"As stated before, we are very well satisfied with it and cannot recommend it too highly. It is the answer for the smaller contractor who wants to know where he is at."

Convention Program Highlights

"Dollars and Sense" is to be the keynote of the program of the Thirty-fourth Annual N.E.C.A. Convention to be held at the Atlanta Biltmore Hotel, Atlanta, Ga., October 12, 13 and 14. The first session will start at 9:30 A.M. on Monday. Plans are being made to handle the largest attendance in many years.

Each subject and discussion on the program has been selected as presenting helpful solutions to one or more of the following six electrical contractors' problems:

1. Stronger Organization.
2. Closer Industry Cooperation.
3. Higher Industry Standards.
4. Better Salesmanship.
5. Fairer Competition.
6. More Profitable Business.

Among the speakers already announced are the following:

Earl N. Peak, president, N.E.C.A., "Qualified Contractor Plan and Its Policing."

R. M. Walker, chairman, N.E.C.A. Distribution Committee, "Building Economic Trade Relations."

C. E. Swartzbaugh, president, Swartzbaugh Manufacturing Company, Toledo, Ohio, and vice-chairman, Electrical Industry Promotion Committee, "Business Development."

Joseph C. Fitts, secretary, Heating, Piping & Air Conditioning Contractors' National Association, "The Contractors' Viewpoint of Industry Sales Problems."

Samuel G. Hibben, director of applied lighting, Westinghouse Lamp Company, Bloomfield, N. J., "New Horizons in Lighting."

O. R. Hogue, Commonwealth Edison Company, Chicago, Ill., "Getting Adequate Wiring into Homes."

J. W. Collins, secretary, Electrical Contractors' Association of Chicago, Playlet "Let There Be Outlets."

George Andrae, Herman Andrae Electrical Company, Milwaukee, Wis., "The Code vs. Competitive Chaos."

J. R. Stolzenbach, chairman, National Motor Section, N.E.C.A., "Motor Distribution and Servicing."

SNIP!

AND IT'S OUT!

*...here's how the "DE-ION" ARC QUENCHER
assures 100% RELIABILITY IN THE NEW
WESTINGHOUSE LINESTARTER*

SUPER-SAFETY!
No flash or flame—the arc is snuffed out instantly by the "De-ion" Quencher. This means elimination of flashover, assuring safety for operators.

LONG LIFE!
Instantaneous "De-ion" arc quenching means no pitted contacts—practically unlimited contact life. Simple mechanism with fewer parts.

COMPACT DESIGN!
Banishing of arc hazard by "De-ion" quenchers permits a snugly-built, compact mechanism retaining ample wiring space and complete accessibility of all parts for quick installation or inspection.

HERE'S HOW IT WORKS

In the past, arcs have been broken by "stretching." The "De-ion" quencher confines, divides and extinguishes the arc instantly—obviously preventing concentration of burning heat on contacts and arc barriers.

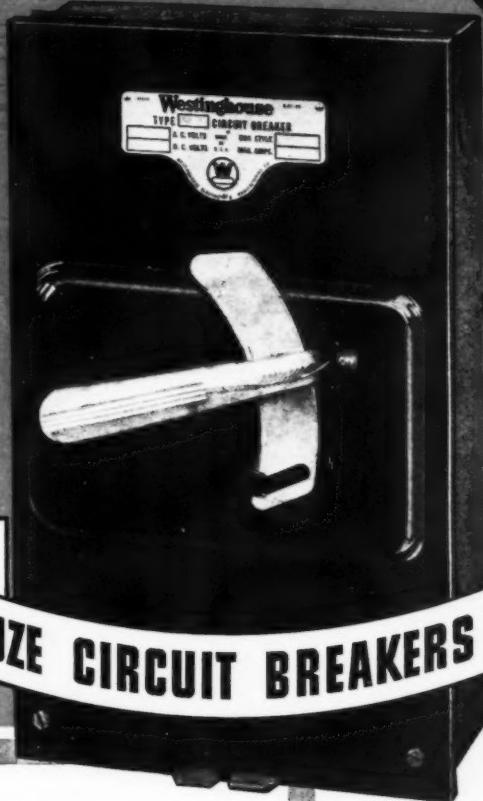
WESTINGHOUSE GOLDEN JUBILEE

J-20042

Westinghouse
"DE-ION" LINESTARTERS

MAKE "FUSELESS WIRING PROTECTION"

help you sell all three...



1
NOFUZE
BREAKER
ORDER

2
WIRING
JOB

3
MAINTENANCE
CONTRACT

Draw on this complete line, perfected by 50 years of electrical experience . . . backed by a mighty name.



CS (A-C.) MOTORS for any constant speed drive—all sizes and types from 1 hp. up.



SK (D-C.) MOTORS — Industry's most popular general purpose d-c. motor



NEW "DE-ION" LINE-STARTERS—Most important forward step in entire history of motor control.



"DE-ION" SAFETY SWITCHES—Of every size and type, with the exclusive "De-ion" arc quencher.

Get the jump on your competitors . . . show your customers the advantages of Fuseless Circuit Protection which pays extra dividends of SAVINGS plus SAFETY. Sell your customers on the fuseless idea and you'll land a circuit breaker order and also a wiring job. And here's a *plus* . . . these modern installations prove so satisfactory that in a number of cases the contractor has received a maintenance contract.

Ask your nearby Westinghouse Electrical Jobber for full details on all types and sizes, and proof that Nofuze Breakers save money.



Westinghouse

J 20067

"THE MARK OF QUALITY"

WE CAN SUPPLY
MORE THAN 1200
TYPES AND SIZES
of "ELECTROLETS"



Killark Conduit Fittings are stocked in our 14 warehouses strategically placed throughout the country and contractors who want to be sure of the proper fittings for the job have a complete and reliable source of supply from jobbers everywhere.



Some of the items included in our complete line are: Service Entrance Fittings, Conduit Bodies, Flush Switch Fittings and Various Standard Expansion proof Fittings. Killark "ELECTROLET'S" are well known, better made, and easier to use and enjoy a wide acceptance with contractors everywhere because of these distinctions. The shape of Killark Fittings - "pig-like" - was chosen for best service - they stay put. All fittings are made of unbreakable malleable iron, cadmium plated, in all types and sizes usually required. Send for bulletin and complete information.



**KILLARK ELECTRIC
MANUFACTURING CO.**
ST. LOUIS MISSOURI



George W. Patterson, chairman, N.E.C.A. Cost Data Committee, Toronto, "The Most Important Tool on the Job."

J. J. Caddigan, Edison Electric Illuminating Company, Boston, Mass., "Contractor - Dealer Merchandising School."

L. W. Davis, general manager, N.E.C.A., "Simplified Accounting."

Two interesting sessions of the convention have been arranged for symposiums of ten minute talks by members. One of these sessions will present the progress of state and local organization work and the other will present keen analyses of electrical contractors' problems and helpful solutions.

J. M. Clayton, chairman of the Atlanta Entertainment Committee has announced the following entertainment features:

Monday Noon—Luncheon for the ladies at Country Club, Brookhaven. Ride through north side residential section.

Monday Evening—Dance at Atlanta Biltmore for delegates and ladies.

Tuesday Noon—Luncheon for ladies at Druid Hills Golf Club, with trip to Stone Mountain and visit to Cyclorama in Grant Park.

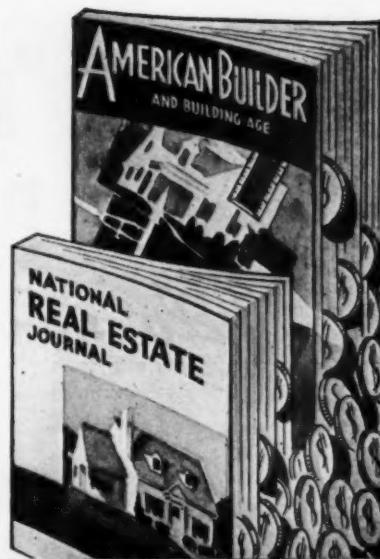
Tuesday Evening—Banquet, with negro spiritual songs, followed by dancing.

Wednesday Noon—Luncheon for all delegates and ladies at East Lake Golf and Country Club. Golf tournament for men with prizes, and bridge tournament with prizes; followed by a real southern barbecue and special features of entertainment.

Manufacturers' exhibits of new products on the mezzanine floor of the hotel will be one of the interesting features of the convention.



COST ANALYSTS: During the twenty-seven years that Wm. K. Grace has been in business at Dallas, Tex., every possible record of labor costs was gleaned from each job. Today the Wm. K. Grace Engineering Co. possesses a voluminous record covering the operations on many large projects that were wired in various Texas cities by this company. Wm. J. Grace (left), since graduating from Rice Institute has joined his father as secretary and treasurer of the company.



**EMERSON
ADVERTISING
Helps You Profit
in the
BUILDING MARKET**



**FIRST HALF OF 1936
Shows Tremendous Gain
In All Construction**

**Emerson Exhaust and
Ventilating Equipment
Keeping Pace**

Read these figures. First half of 1936, residential construction gained 61% over same months of 1935; non-residential up 89%; public works and utilities 76%.

That's the market, Mr. Electrical Contractor, that is being made conscious of the importance of ventilation with Emerson Exhaust and Ventilating Fan advertising in the American Builder and National Real Estate Journal, the market that will continue to include in its expenditures immense amounts for Exhaust Fans and Ventilating Fans. You are the logical source of supply—and Emerson is ready with a complete selection of equipment.

Emerson Exhaust and Ventilating Fans are of superior quality, time-tested for years, proved in every conceivable service to give long life and quiet, trouble-free performance at low cost. Don't pass up your share of these new Fan Profits.

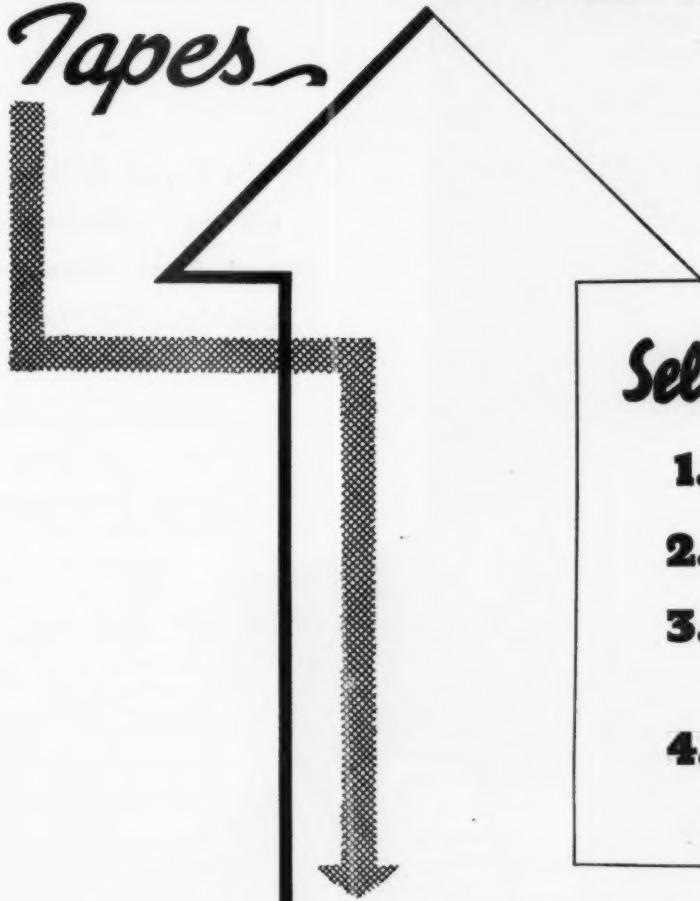
**Write for Complete Details Today
Ask for EMERSON EXHAUST
and VENTILATING FAN Plan**

THE EMERSON ELECTRIC MFG. CO.
ST. LOUIS / Branches: Chicago / Detroit / New York

EMERSON ELECTRIC
MOTORS - FANS - APPLIANCES

Leaders in the FAN and MOTOR INDUSTRY since 1890


DRAGON
and 
PANTHER
Tapes.



Sell Readily Because

- 1. Modern Packages.**
- 2. Cellophane Sealed.**
- 3. Made by one of the oldest tape makers.**
- 4. Is everything a good Tape should be.**

HAZARD INSULATED WIRE WORKS

Manufacturers of Insulated Wire and Cable for Electrical Contractors

Division of

THE OKONITE COMPANY

Factories:

Wilkes - Barre, Pa.

Passaic, N. J.

TO HELP YOU BUY— —leading manufacturers will give you in Electrical Contracting's forthcoming

The new Buyers Reference Number* of Electrical Contracting is now being completely revised and brought up to date.

Many manufacturers will supplement their listings in the new Buyers Reference with further details and illustrations of their products, catalog data, lists of branch offices, warehouses, etc.

Consult this valuable data when planning, specifying or buying — you will save time and money.

ELECTRICAL CONTRACTING
330 West 42nd St., New York, N. Y.

*The Buyers Reference
will be published as
part 2 of December
Electrical Contracting



detailed information on their products

Annual Buyers Reference Number

A PARTIAL LIST OF MANUFACTURERS WHO HAVE ALREADY RESERVED SPACE:

ACKERMAN-JOHNSON CO.	CURTIS LIGHTING INC.	MARK & CO., CLAYTON	SHAKEPROOF LOCK WASHER
ACME ELECTRIC HEATING CO.	CUTLER-HAMMER, INC.	MARQUETTE ELECTRIC	CO.
ADAM ELECTRIC CO., FRANK	DANTE ELECTRIC MFG. CO.	SWITCHBOARD CO.	SHERMAN MFG. CO., H. B.
AIRCRAFT MFG. CO.	DECLECO INC.	MATTHEWS CORP., W. N.	SIGNAL ELECTRIC MFG. CO
ALLEN-BRADLEY CO.	EDWARDS & CO.	McGILL MFG. CO.	SILVEY PIPE BENDER CO.
ALLEN CO., L. B.	ELECTRIC SOLDERING IRON	MENDELL ELECTRIC MFG. CO.	SIMPLET ELECTRIC CO.
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CO.	KLEIN & SONS, MATHIAS	CO.	SUPPLY CO.
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Contracting . . .

News . . .

Farm Wiring Specification Form

Four new services will soon be available for members of the Minnesota Electrical Council. One is a contract and specification form for farm wiring. It is being developed as a 4-page form containing full details as to outlets, yard spans, and fixtures. Space is being left for the insertion of other outlets. This is not only to take the place of lengthy quotations but also to permit the preparation of a clear specification and a better degree of adequate wiring.

Other services are for appliance stores. Two of them, a certified value plan and a trade-in control plan, are intended to prevent over-extension in trade-ins. The remaining service is a return goods invoice form.

Iowa Reorganization Meetings

Two meetings have recently been held in Iowa for reviving association interest among electrical contractors of that State. At a meeting held in Des Moines on June 22 for the purpose of reorganization, there were 36 contractors present, also about 30 representatives from other branches of the industry. Because of the interest that was expressed at this meeting, a second meeting was held in Marshalltown on August 12 which was attended by members from all over the state.

Floyd A. Wallace, executive secretary of the Master Electricians Association, Inc., of Des Moines, was also made state manager of the Iowa Association of Electrical Contractor-Dealers as of July 1. Mr. Wallace reported 41 state members of record on August 12 with prospects of more members joining in the near future.

Earl N. Peak, president of N.E.C.A., addressed both meetings on the industry coordination program. Mr. Peak appeared before joint sessions of all industry groups, and also at separate sessions of contractors, wholesalers and power company executives.

The new state association officers are: V. L. Thomas, Des Moines, president; H. J. Ryan, Sioux City, vice-president; H. W. Biermann, Des Moines secretary-treasurer; executive committee, W. L. Fowler, Cedar Rapids; P. A. Schlueter, Davenport; H. J. Ryan,

Sioux City; C. F. Nagle, Waterloo; Don Stroh, Des Moines; A. C. Rohwer, Dennison; Raymond Determan, Mason City; M. J. Frazier, Burlington, and L. O. Novotny, Marshalltown.

Wisconsin Association Renews Legislative Program

Rural wiring and inspection, procedure to secure a state licensing bill, and industry relations were the dominating subjects of the summer meeting of the Wisconsin Electrical Association, which was held August 3 and 4 at Wisconsin Rapids. The meeting was attended by about seventy-five electrical contractors from all sections of the state. A large number of associate members representing other branches of the industry also attended.

To promote a new state licensing and inspection bill that is somewhat similar to one which failed of passage in the legislature two years ago, a legislative committee of ten persons was appointed which includes the following electrical contractors: R. J. Conklin, Watertown; R. F. Poland, Sparta; R. J. Nickles, Madison; M. F. Hodge, Medford; M. L. Carey, Wisconsin Rapids; R. J. Knoerr and H. W. Livingston, of Milwaukee.

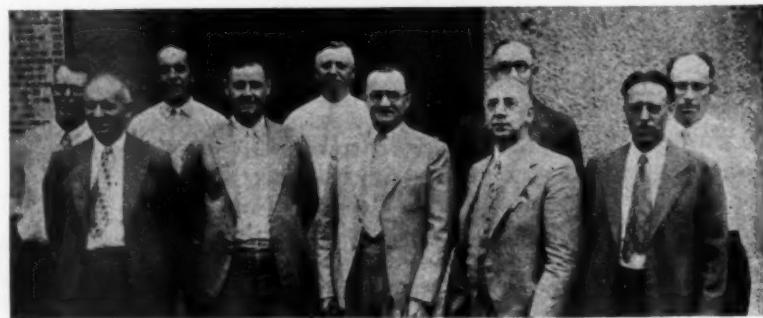
The program included addresses by: J. E. Wise, electrical engineer, Wisconsin Industrial Commission, on "The Inspection Problem"; and R. Bourke Corcoran, uniform legislation department, NEMA, on "Trends in State and Local Legislation and How the Electrical Manufacturer is Affected Thereby."

J. E. Kennedy, executive secretary of the Wisconsin Mutual Insurance Alliance, while discussing the hazards of improperly wired farm risks announced the formation, by his organization, of a private rural inspection staff that would inspect electric wiring for farm risks covered by applications for fire insurance. This service will be conducted pending the enactment of state legislation in the interest of 195 companies carrying insurance in the state, which claim to have experienced electrical fire losses in 1935 that amounted to about \$750,000. About 16,400 farm wiring installations are expected to be made during 1936, according to Mr. Kennedy.

R. J. Nickles, executive committee-man of the N. E. C. A., spoke on recent services that have been made available to members of the National, and why electrical contractors should become N. E. C. A. members.

Wisconsin's rural electrification program was outlined by John A. Becker, acting state director of rural electrification coordination. Claiming that about one-fourth of the farms in Wisconsin were already electrified at the end of 1935, nine REA projects have been definitely approved out of nineteen submitted to Washington from among forty-one that were proposed. These nine projects were stated to involve rural line construction amounting to \$2,606,000 and are expected to serve about 6,500 farms. Mr. Becker reported that of 22,000 questionnaires, which had been received from farmers wanting farm electrification in their communities, about ninety per cent listed radios as the first reason, while eighty per cent named water pumping as their second reason for wanting electricity.

Other items on the program included "The Kitchen of Tomorrow" by C. E. Swain, Malleable Iron Range Company; range and water heater sales reports, cooperative wiring design service, and industry relations, by various power company executives; the attitude of organized labor toward legislation fostering inspection and licensing, by a representative of I. B. E. W.; and dis-

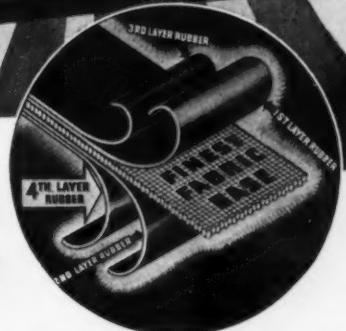


Officers and executive committee

Front row (left to right) E. M. Streich, Merrill; R. F. Poland, Sparta; M. J. Rilling, Wausau, vice-president; H. F. Trester, Milwaukee; M. F. Hodge, Medford, president. Back row: William Chamberlain, Ladysmith; M. L. Carey, Wisconsin Rapids, secretary; Roy Springer, Superior; R. J. Nickles, Madison; E. P. Kissinger, Waupaca.



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The Jumbo Package

Contains 10 standard No. 8 rolls. The economical way for repairmen, electrical contractors and industrial users to purchase Friction Tape where individually cartoned tape is not required.



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Rubber Insulating Tape
Fuses instantly without heat. Molds into one solid piece. It a-r-e-i-c-h-e-s without breaking because it contains more live, new rubber. Approved by Underwriters Laboratories.

Standard Packages

The Nos. 8, 4, 2 and 1 sizes are all available in the well known orange and blue individual and display cartons and metal counter dispensers for retail sale.

This is how a piece of DUTCH BRAND Friction Tape would look if magnified and separated into its parts. It's the fourth layer that gives DUTCH BRAND many of its unusual qualities.

- DUTCH BRAND Friction Tape can take it! DUTCH BRAND chemists have produced a Friction Tape that stands up for years and years... under all kinds of conditions, in dry, damp climates or salt air!

No extra cost of re-taping or jeopardizing an important job when you use DUTCH BRAND, made by our own 4-ply process (4 layers of rubber instead of 3). It's not just good tape, but an "Extra-Service" product that costs more to make, but costs you less to use!

DUTCH BRAND Friction Tape, Rubber Tape and Soldering Paste are sold by electrical jobbers everywhere

VAN CLEEF BROS. Established 1910
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DUTCH BRAND *Friction Tape*

EXCEEDS THE QUALITY SPECIFICATIONS OF THE A. S. T. M.



NOW—how to repair and rewind all types of motors . . .

ELECTRIC MOTOR REPAIR LIBRARY

4 volumes, \$10.00, payable in
easy monthly installments

THIS set of books should be on the shelf of every man who ever has to touch a motor for purposes of repairing it or changing it to meet different operating conditions. In shop language and with practical shop methods it covers every step in stripping, rewinding and connecting a.c. and d.c. motors of all kinds.

Do you know how to:

- lay out a wave winding
- test a.c. and d.c. motors to locate grounds, shorts, opens, quickly and positively
- properly record data when stripping armatures so that it will be instantly usable for correct rewinding by yourself or any experienced winder at any time afterward
- detach armature from frame without cutting out
- lay out single-phase fan motor windings
- change single-phase windings for two- or three-phase operation
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- lay out frog-leg windings
- handle every job in a rewinding job from the time it comes into the shop until it leaves
- wind stators for tubogenerators
- band high-speed armatures
- rewind motors for voltage, speed, frequency, or cycle changes
- etc., etc., etc.

1,000 pages of practical shop methods and data on jobs like those in this library. A complete, modern key to repair of all motors. Nothing like it; every page filled with definite, practical facts for the industrial maintenance man and the electric shop worker.

How to change motors for different operating conditions

Here is all the information you need in order to determine what changes various types of motors permit; to lay out new windings for specified service conditions; and to handle every step in the work with satisfactory results. Covers all types of motors, from those used in small household and commercial appliances of all kinds, to massive and powerful industrial and traction machines. Giving the different types of windings; gives definite instructions for doing the various rewinding jobs. Also gives many data, tables and diagrams constantly needed by the repair man, including data difficult to get from any other sources.

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HEADS OMAHA GROUP: Through the years, C. O. Heath of Omaha, Nebr., continues his interest in local association affairs as president of the Master Electrical Contractors Association. With 19 association members again keeping busy, Mr. Heath finds association work more interesting. The Heath Electric Co. recently completed a large motor installation for air conditioning a local chain store.

cussions regarding assessments and exemptions under the Unemployment Compensation Act of Wisconsin, by staff members of the Wisconsin Industrial Commission. Frank J. Seiler, assistant editor of ELECTRICAL CONTRACTING, spoke at the evening banquet meeting.

The next meeting will be held at Milwaukee, January 11 and 12, 1937.

Liability for Unemployment Tax on Small Contractors' Men

Is a contractor installing range wiring for a public utility an independent contractor or an employer of the utility? This question has arisen with respect to the Wisconsin Unemployment Compensation Act.

The utilities have interpreted a ruling by the Industrial Commission of Wisconsin as requiring them to pay assessments under the act on a contractor's men doing appliance wiring for them when that contractor employed less than eight persons and had not elected to come under the Act. In a letter to ELECTRICAL CONTRACTING, Austin Thorson, senior examiner, unemployment compensation department of the Industrial Commission, states that no general ruling covering such employment has been made and that each case will be individually decided.

The point in question comes up as the result of a provision in the Act which calls for payment of the assessment by the owner on work done by a contractor not liable to assessment, when the employer has been in the habit of doing such work himself.

The utilities, however, in order to clear up the situation, are planning on a test case soon. In the meantime, it is not expected to interfere with their contractor relations.

The ruling has had an effect upon industrial business. Several large concerns which do a certain amount of their own electrical work will no longer employ any contractors who are not under the Act.

While this is entirely a Wisconsin ruling, enquiry was made in Washington as to whether the Social Security Act might be interpreted in the same manner. The Bureau of Internal Revenue states that principal contractors will not be liable for the tax on employees of sub-contractors employing less than eight persons unless there is evidence of evasion. In border line cases, each decision will be based upon the facts as to whether the sub-contractor is really operating on a contract basis or being used to disguise an actual employer-employee relationship.

Chicago Starts Surface Extension Outlet Campaign

With a basic charge of \$15 for five convenience outlets, a new cooperative surface extension outlet campaign, restricted to residences and apartment houses, was begun late in July at Chicago, Ill. Higher prices are charged when less than five outlets are ordered. A scale of \$1.06 per hour will be paid to union mechanics, and an average production of ten outlets per day is predicted.

According to J. Walter Collins, secretary of the Electrical Contractors Association of Chicago, about 85,000 new outlets were sold during an earlier campaign that started in 1926. The previous campaign entailed the general use of concealed non-metallic sheathed cable at higher prices per out-



BOOTLEGGER SLEUTH: As executive secretary of the Master Electricians Association, Inc., of Des Moines, Ia., Floyd A. Wallace has conducted an aggressive campaign to discourage bootleg wiring. Mr. Wallace has uncovered numerous examples for the local inspection department which have resulted in prosecutions and have been responsible for diverting considerable work to qualified electrical contractors. In addition to his local duties, Mr. Wallace has, since July 1, taken on the position of state manager for the Iowa Association of Electrical Contractor-Dealers.

SANGAMO ELECTRIC COMPANY

THE UNSEEN HAND



Sangamo Form VSZ Synchronous Motor Time-Switch with astronomic dial for changing automatically "on" and "off" operations in accordance with sunset and sunrise.

... that makes this installation
COMPLETELY AUTOMATIC

Industrial managements usually take great pride in their plants (we do!). Thousands of firms display their name with electric signs or floodlighting. They offer a real opportunity if you are minded to sell them Sangamo Time-Switches.

But . . . you must first tell them how this unseen hand enables savings because it never forgets to turn lights on or off . . . how it eliminates dependence on the watchman's memory . . . how it makes this type of installation *completely* automatic . . . why it operates faithfully year in and year out.

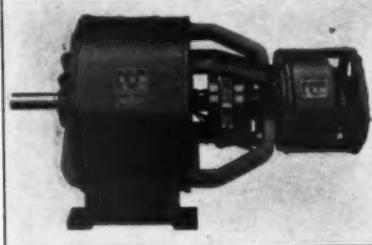
SANGAMO TIME-SWITCHES for

Display Window Lighting
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—and many other applications where

Industrial Lighting
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Apartment House Lighting
Motor Control
COMpletely automatic control is desired

SANGAMO ELECTRIC COMPANY SPRINGFIELD
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For Better Service...

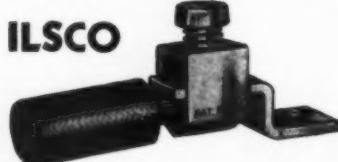
Columbia A.C. Generators have that sturdy, clean-cut appearance which only modern design and precision manufacture can give. And they are easy to sell. Sizes range from 1 to 100 KVA, single or three phase and with speeds suitable for direct connection or belt drive to gasoline or Diesel engines. May we explain our liberal dealer proposition to you?

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SIMPLE, ISN'T IT?



SOLDERLESS CONNECTOR

NOTICE: The triangular wedge formed by the tang and V-bottom collar, which forces the wire into a solid mesh—



NO set-screw contact . . .
NO flattening or separating of wires . . .
NO limitation to one size wire . . .
NO shearing effect whatsoever . . .
NO special tools required to make connection . . .

No need for you to search any longer for the PERFECT Solderless Connector—WE HAVE IT!



Ilasco solder lugs show the size of the largest wire they will take.

FREE—A large display board, containing mounted samples of ILSCO lugs. Sent upon request.

ILSCO COPPER TUBE & PRODUCTS, INC.
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let than the present prices using "Add-Here."

A staff of fifty salesmen employed by the Commonwealth Edison Company will carry on the sales campaign. They will receive their commissions for all sales direct from the company thus making the customer rates of \$15 for five outlets a net return to the contractor. The work may be paid for by the customer in monthly installments running over a period of fourteen months, although the contractor is paid upon satisfactorily completing the job. At present the city has been divided into five zones, in each of which one electrical contractor will specialize on outlet campaign installations.

Because this campaign is expected to result in the replacement of many dangerous cord wiring extensions, the electrical inspection department permit fees have been modified to allow two premises, if not exceeding a total of ten new outlets, to be handled on one \$1.50 fee, plus fifteen cents for each additional outlet above ten. These fees apply only when no other wiring is involved on the premises. The installation rules limit runs of "Add-Here" to the room in which they originate. Surface runs may not be extended from ceiling outlets. Where no suitable wall outlets are available, the first convenience outlet in a room may be installed with concealed non-metallic sheathed cable from the nearest existing source of supply. "Add-Here" is not to be permitted in basements or attics. When run on walls, painted surfaces must first be cleaned, and kals-



REMODELLING SPECIALISTS: The Henry W. Miller Electric Co. of Omaha, Neb., handles office and store remodelling work on a large scale, having recently completed the wiring for what is claimed to be the largest air conditioning system in Iowa. A department store job in Des Moines had 57 motors totalling 1200 hp. Mr. Miller assigned the supervision of this work to his son, Harold H. Miller (right). Two other sons, Norman and Clifford, are to join the company after graduating from their engineering courses.

somine or wall paper must be removed along the route that is to be used for gluing on runs of surface wiring.

With eighty per cent of Chicago's residents estimated to be tenants, this drive will include a special attempt to enlist the aid of tenants who want convenient outlets, but who will not pay the entire wiring cost. A cost-sharing plan is proposed by which the owner will pay for at least one-half the wiring for a tenant.

Panorama of Power

A Panorama of Power will be exhibited in connection with the Third World Power Conference to be held in Washington, September 7 to 12. This exhibition will include all of the latest advances in lighting and many utilization devices.

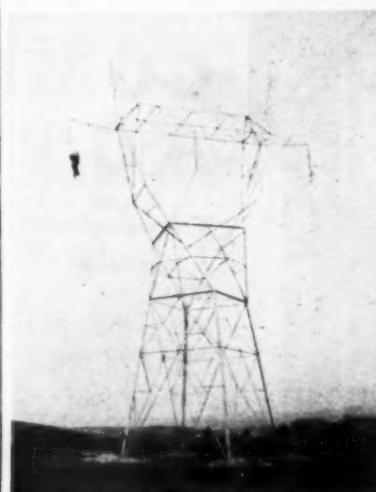
In addition to the meetings, a series of trips to various large power sources have been arranged for visiting foreign delegates.

WPA Labor Shortage

Little skilled labor is left on relief rolls. Cities which agreed to use 100 per cent relief labor on their PWA projects now find themselves in a predicament.

The question now arises as to whether PWA will allow use of loan and grant funds for the hiring of such skilled labor as cannot be found among those on relief or whether the municipalities will have to raise additional funds for that purpose.

To meet the skilled labor shortage Congress will be asked to appropriate \$2,000,000 for advance transportation money to be paid back by the men shifted. Any losses incurred would be more than made up by the saving in removing such persons from relief rolls, it is argued.



HIGH-LINE CONSTRUCTION: The A. S. Schulman Electric Co. of Chicago, Ill., obliges with photographs and a summary of its operations in constructing about 131 miles of 154-k.v. high tension lines in Tennessee from Norris Dam to Cole City. There are 705 5 1/2-ton steel towers, from 75 ft. to 175 ft. high, with an average span between towers of 1100 ft. to carry 500,000-c.m. steel core aluminum cables. The work was largely done in rugged country where rock or stone formation made hand digging necessary. Concrete foundations with reinforced steel were provided for 182 towers. The company employed 14 trucks, 2 air compressors, and a boring machine on this project.



TWO TOUGH BIRDS FOR AMERICA'S TOUGHEST JOBS

TRICO FUSES

These fuses were expressly designed to accommodate TRICO non-interchangeable links only. Thus you are assured, year after year, of safe tamper-proof protection with a superior time-lag that only powder-packed elements can give.

Sample on Request



KLIPLOK CLAMPS

Should be used on all fuses regardless of make. Eliminate burnt fuses and clips, unnecessary shut-downs and tremendous waste of current due to heating. KLIPLOKS are a dividend-paying investment—not an expense.

FOR THREE TIMES THE SERVICE INSTALL TRICO FUSES AND KLIPLOK CLAMPS

If your Jobber cannot supply you write—
TRICO FUSE MFG. CO., DEPT. D., MILWAUKEE, WIS. U. S. A.
In Canada—IRVING SMITH & CO., MONTREAL

COLORTOP FUSES COLOR TELLS SIZE	OPTO-MATIC OLIERS SAVE OIL AND BEARINGS	FUSE PULLERS NON-BREAKABLE	RENEWABLE FUSES WITH NON-INTERCHANGEABLE TAMPER-PROOF POWDER-PACKED ELEMENTS	ONE-TIME FUSES BUILT FOR SERVICE	Drip-Drop OLIERS SAVE OIL AND BEARINGS	KLIPLOK CLAMPS SAVE FUSES AND CLIPS

PREFERRED FOR QUALITY



For Residence Wiring

The Best and Safest Method is a properly installed KNOB and TUBE job. Be sure and get the

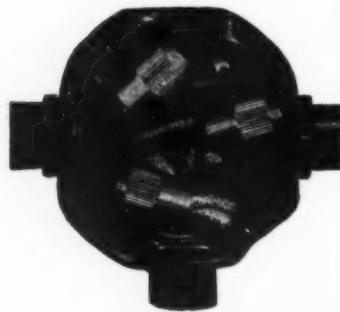


Assembled Knob because it "HAS A GRIP LIKE ITS NAMESAKE."

ILLINOIS ELECTRIC PORCELAIN CO.
MACOMB, ILLINOIS



WIRING COSTS REDUCED ESTIMATING MADE EASIER



Solderless IDEAL Tapeless WIRE CONNECTORS

Require no tools. "Thread-on" in a jiffy, making a connection that can't be loosened or short circuited. Reduce wiring costs! Estimating is easier, more accurate, because the chief time variant is removed. Check up! Fully approved. Listed by Underwriters' Laboratories.

Samples and literature on request.

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A Roll o' Tape

**Field notes about
men of the contracting
shop, and inspection
branches of the industry**

DUAL baking ovens are used in the Houston (Tex.) Armature Works, one oven for pre-heating equipment that is to be impregnated, and the other oven for the baking of varnished windings.

THAT P.W.A. jobs are not for those who shun office routine is attested to by J. M. Whalen, Commonwealth Electric Co., St. Paul, Minn. Exactly fifty-five application-for-payment forms were recently prepared for Mr. Whalen's signature.

LIKE putting a new link in an old chain, this business of patching up old wiring systems, says F. A. Goodson, chief electrical inspector of Houston, Tex. To make a good job, he advocates making the service and feeders adequate for the additional load before granting approval.

RESERVE your best men for steady customers, says Henry W. Miller. The Miller Electric Co. of Omaha, Neb., does a major portion of that city's office building remodelling work, and holds on to it by making sure that the customer gets the same men on every call.

S HOPMEN who stuck through the depression with the Boustead Electric & Manufacturing Co., Minneapolis, Minn., experienced employment of 125 per cent of regular hours, plus a 5 per cent bonus for the year 1935, according to George P. Svendsen.

DURING the depression it was possible to render such prompt service on trouble calls that customers became badly spoiled, says H. F. Trester, Trester Service Electric Co., Milwaukee, Wis. With shops becoming busy

again, it is necessary to wean these people away from expecting an immediate response. Some of them are found to overdo the thing, in Mr. Trester's opinion, because they can often wait their turn under regular procedure.

GOOD take-offs require set methods, in the opinion of James Dandekar of the Miller Electric Co., Jacksonville, Fla. Instead of a rotometer or scaling ruler, he uses a short flexible steel roll-up tape which is marked off in feet for $\frac{1}{4}$ in. scale on one side, and for $\frac{1}{8}$ in. scale on the opposite side. As runs are measured yellow lines are quickly traced in to indicate the take-off, and to prevent a re-measurement of that run. Mr. Dandekar takes off outlets upon a summary schedule before the conduit runs are scaled off.

QUALITY house wiring jobs can be developed by looking out for the customers' real needs and explaining them early in the construction of a house, says J. J. Newell, of the Newell Electric Co., Inc., Orlando, Fla. Just now he's wiring a house about 20 miles away which has been built up about 25 per cent in outlets.

TRIPLING the main service capacity for a large retail store from 400 amps. to 1200 amps. resulted after the Magaw Electric Co., of Milwaukee, Wis., made a local check-up to cover adequate store lighting feeder capacity. Now a complete high intensity window and sales-room job is in, and Magaw has all the work.

JUST to get the facts and let others get them, too, Wm. L. Marks, Marks Electric Co. of Chicago, Ill., recently conducted a night-time demonstration of installing non-metallic surface extension wiring at his home. A regular wiring crew did the experimental job under actual conditions while outlet campaign salesmen and other interested parties were invited guest-observers.

RESIDENCE wiring may be placed on a more profitable basis than low-dollar competition, according to Henry H. Hansen of the Allied Electric & Fixture Co., Lincoln, Neb. Selling the idea of lasting devices, chimes, circuit breakers and correct locations for wall outlets has pulled several jobs out of the cheap class for Mr. Hansen this year.

E VOLUTION in the electrical capacity required for commercial occupancies is pointed out by Frank S. Leisure of the Frank Leisure Co., Inc., Chicago, Ill. A 45-year man in the business, Mr. Leisure reminds us that about 3 hp. in motors was the average for his

YOUNGSTOWN

BUCKEYE CONDUIT

Nothing Left to Chance

YOUNGSTOWN "Buckeye" CONDUIT, from ore mine to shipping platform, is the product of a single organization.

At no step in the process is there an opportunity for deviation from the rigid standards, maintained for more than thirty years, on which the "Buckeye" trademark has built its well-earned popularity with contractors, architects and building owners.

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon and Alloy Steels
General Offices Youngstown, Ohio

Sheets; Plates; Tubular Products; Conduit;
Tin Plate; Bars; Rods; Wire; Nails;
Unions; Tie Plates and Spikes

First step in the manufacture of
BUCKEYE Conduit... making steel
in a Bessemer converter.



HOT GALVANIZED

BLACK ENAMELED

ELECTRO GALVANIZED



NO. 330 "LATROBE"
TOM THUMB
UTILITY OUTLET

For use in wood installations and other locations free from moisture or mechanical injury.



NO. 470 PIPE OR
CONDUIT HANGER

Pipe support can be turned freely, permitting pipe to run parallel, or at right angles to beam. Eliminates drilling or use of straps. Will accommodate sizes of $\frac{1}{2}$ ", $\frac{3}{4}$ ", and 1" pipe to steel beams $\frac{3}{8}$ " thick.

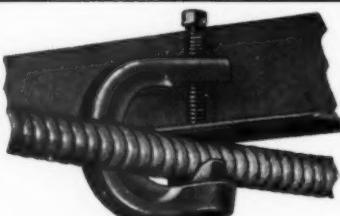
Fullman also offers Insulator Supports, Fish Wire and Conduit Binders.

Time Saved is Money Earned

Insure your profit on every job with Letrode floor boxes and wiring specialties. Letrode products can be installed in a few minutes — no small screws or complicated parts. And practical design and sturdy construction guarantees perfect performance.

The complete Fullman catalog and price list is yours for the asking.

FULLMAN MFG. CO.
LATROBE • • • PENN.



NO. 480 "BULL DOG" ARMORED
CABLE SUPPORT

A new, lightweight, strong clamp for supporting or hanging cable to steel framework. Permits hanging from any angle. Best and most economical way of temporarily or permanently installing armored cable in buildings of steel construction.

chain store jobs of 20 years ago, while today air conditioning, kitchen equipment, and other mechanical loads use not less than 25 to 40 hp. for rather small stores of this type.

A LONG-TIME municipal service record for inspectors is that of two men of the Dallas, Tex. electrical inspection department. E. H. Pratley, chief inspector, has been on the job about 22 years, while deputy inspector Harry W. Herzberg has served for 17 years.

ALTHOUGH making no particular effort in merchandising, the Pioneer Electric Co. of Lincoln, Neb., has its new office arranged to accommodate a display of several major appliances. Old wiring customers drop in occasionally or send friends to the office who buy enough appliances to justify setting aside a neat display space.

LOCK jobs are long on ducts judging by the contract for installing some 60,000 ft. of fibre conduit that the R. D. Speers Co., of Davenport, Ia., has under way on the upper Mississippi system of government locks.

ONE of the early attic ventilation installations in Moline, Ill., was installed seven years ago in the home of A. Simko, Simko Electric Co. This pioneer experiment in house cooling proved so satisfactory that Mr. Simko's company has branched out from an original motor repair business to assembling and manufacturing various types of fans and blowers.

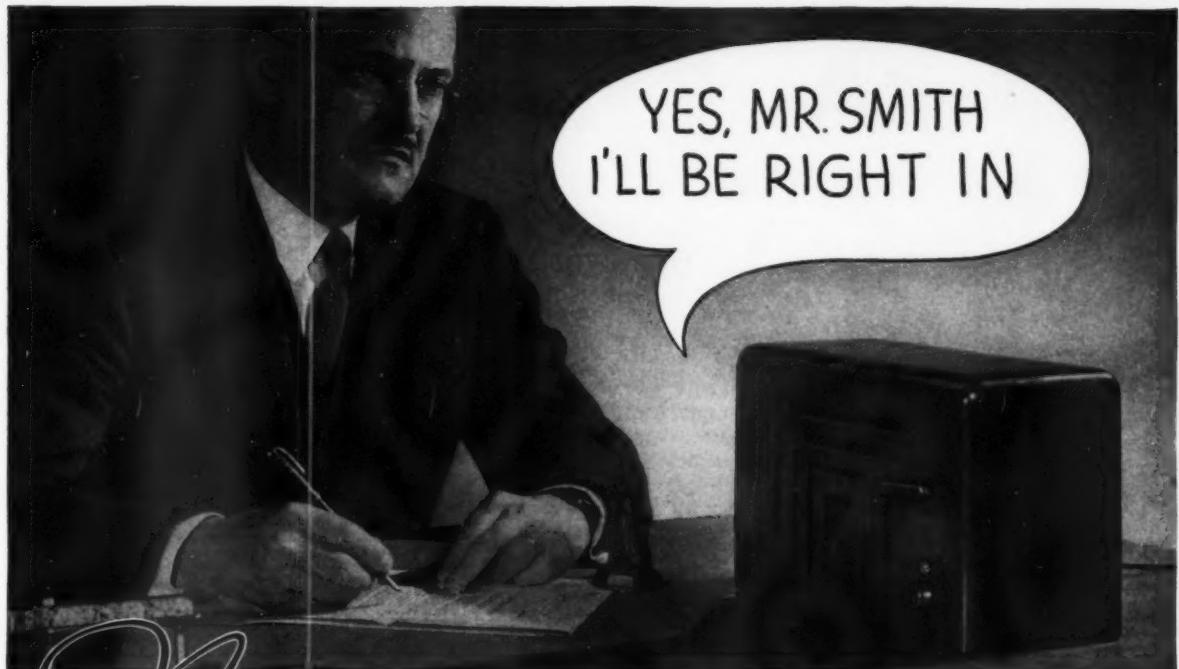
SPECIAL letters to prospective customers, quotations, etc., are sent out by the Wm. K. Grace Engineering Co. of Dallas, Tex., on a folding letter-head which includes photographic reproductions of fourteen large buildings that were wired in various cities by this company. These reproductions occupy three pages of this four-page folding letter head, therefore permitting space for each structure to bear a printed caption.

MUCH consternation prevails among some contractors who have again become busy, but who no longer have their old-time mechanics. Not so with George Andrae, Herman Andrae Electric Co., Milwaukee, Wis., because particular care was taken to maintain a work-sharing program during dull years which has prevented old hands from drifting away.

GRAN handling costs were too high when regular railroad car unloading devices were employed for handling truck loads at a large grain elevator that was recently wired by the Industrial Electric Co. of Minneapolis, Minn. George R. Jones,

ELECTRICAL MANUFACTURERS

See pages 48 and 49 for an unusual opportunity to sell thousands of your most important buyers!



New-A Two-Way Communicating System That You Can Sell to Every Type of Business

Here is a two-way inter-communicating system that every business institution, large or small, can use to great advantage. And you can sell it at a good profit. It offers a wider market than any other item you are now selling. It is compact, good looking, has high tone fidelity, easy to install, and is priced far lower than the conventional type of communicating system.

This new unit is built to precise Webster Electric Standards of quality—not down to a price.

The unit is attractive—it is housed in a hand rubbed walnut cabinet. Each cabinet of the system measures only 6"x10"x12". It is extremely simple to operate. Merely press the control lever downward to speak, then release to listen. Its use requires no extra units, no separate microphone. It is completely self-contained. The jewel pilot light shows when the unit is ready for use.

This two-way communicating system is suitable for either AC or DC; is absolutely hum-free; has a variable volume control; and unusually faithful voice reproduction. Although non-selective, as many as six stations may be operated on a single system. A demonstration means a sale.

Get in touch with your jobber today. If he is not now handling this new two-way communicating system, write direct for complete information. Be sure and address your communication to WEBSTER ELECTRIC COMPANY, Racine, Wisconsin. Export Department, 100 Varick Street, New York City.

Webster Electric Sound Systems are licensed by agreement with Electrical Research Products Inc., under patents owned by Western Electric Company, Inc. and American Telephone and Telegraph Company.



WEBSTER ELECTRIC

Inter-Communicating Systems



DOOR BELLS . . . BUZZERS SKELETON BELLS

WEATHER-PROOF VIBRATING BELLS
TRANSFORMERS

Widely known for quality and low prices—a complete line. If your jobber does not stock Signal Bells, Buzzers, and Transformers, write.

SIGNAL ELECTRIC MFG. CO.
Menominee, Michigan



THE *Badger* 50 AMPERE Synchronous TIME SWITCH ... dependable ... at low cost

Here is a time switch that you can depend upon to give absolutely satisfactory service.

Sell quality and eliminate costly service calls.



See your wholesaler or write for complete descriptive literature.

RELIANCE AUTOMATIC LIGHTING CO
1937 Mead Street Racine, Wis.

therefore, recommended a separate small pit, conveyors and elevator leg with interlocked controls, that would provide safe one-man operation for handling small lots of grain. A saving resulted to the operators, and a handsome additional wiring and equipment order was given to Mr. Jones.

WITH adequate switching layouts coming to the fore, George Hamann of Omaha, Neb., suggests the stamping of plates to identify various controls. This is particularly helpful in halls and other places where several switches occur in a large gang plate.

ILLUSTRATED advertising pieces that are sent out monthly by the G. G. Burkholder Electric Co. of Kansas City, Mo., are displayed in neat individual frames hung along the front offices, just to make sure an interested person may comment or inquire about them.

TWENTY-FIVE years in business is neatly proclaimed by the Hyre Electric Co., Chicago, Ill., by an office poster lettered "Our twenty-fifth year."

WINTER means oil furnace and stoker business, while summer heat offers opportunities for air conditioning to balance the year-round program of the Tri-City Electric Co., Davenport, Ia. With a goal of 100 tons in air conditioning set for the 1936 season, the report thus far shows installations of 65½ tons.

THE "shop on wheels" system for small contracting work has been kept before customers of the Lang Electric Co., Orlando, Fla., with photographs. Mr. Lang mails small photographs of his truck with customer invoices.

DURING the days when Georgia's roads were not so good, the Cleveland Electric Co. of Atlanta inaugurated a regular schedule of sending trucks to its nearby industrial areas every week for picking up motor work. Today this company operates eight such trucks regularly for this purpose, and for the contracting department operations.

IT'S a far cry from claiming to be an industrial contractor and actually qualifying in that capacity, according to J. M. Hengy of Dallas, Tex. Having specialized in such work quite successfully for years, Mr. Hengy knows some of the problems that arise, and which require considerable experience to solve them. All of which, according to Mr. Hengy, still further emphasizes the necessity for other branches of the industry to give the industrial electrical contractor a chance to serve his field profitably.



THE
YOUR JOBBER HAS IT
BEST TAPE MADE

Don't miss the
OCTOBER CONVENTION NUMBER
ELECTRICAL CONTRACTING

—A special convention issue to help you increase sales and profits!

ELECTRICAL CONTRACTING
330 W. 42nd St., New York, N. Y.

HAVE YOU HEARD?

\$10,000



This is the Burndy Connector that was used on the Longwood Towers installation. It is the Qiktap, Type QT, and it can be furnished for any size or combination of conductors up to 2,000,000 cm. Shown below are a few of the many hundreds of Burndy Connectors that can help you save.



Scrulug, Type KPA, can be installed with either screwdriver, wrench, or pliers. In three sizes, for conductors from No. 12 solid to 1/0 stranded.



Servit, Type KS, is a forged service connector that can be installed with an ordinary wrench. It will serve efficiently under excessive vibration or strain.



Tapit, Type PGK, is a Burndy Servit encased in a Bakelite covering. It forms a completely insulated gutter tap which can be installed in a minute.



Qiklug, Type QA, is forged of a high conductivity alloy, and can be used to terminate cables up to 2,000,000 cm. Needs no special tools for installation.

BURNDY
ENGINEERING CO. INC

305 East 45th Street, New York

New Products . . . for September . . .

Paging System

A low cost paging system marketed under name "Lokator", spring-operated, using low voltage, with a minimum capac-



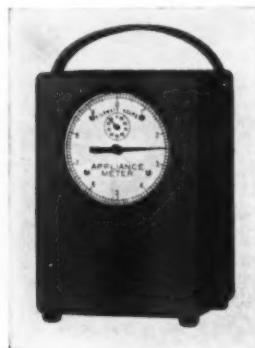
ity of 20 signals. Instrument is 8½-in. long, 5-in. high and 5½-in. deep and has no mechanical or electrical connections to the switchboard. Operator merely slides selector lever to desired signal and depresses lever. Face of Lokator gives all names and signals. Only one to two digit code numbers are used in the standard 20-call device. Device has been developed for marketing through the electrical trade. Edwards & Co., New York, N. Y.

Brush Kits

Two new carbon brush replacement kits, one, No. 7, for series-wound motors used in portable electric tools and the other, No. 6, for small appliance motors. The Ohio Carbon Co., Cleveland, Ohio.

Appliance KW-Hour Meter

For measuring the amount of energy consumed by an appliance during any desired period of time. The "Appliance Meter" employs revolving pointers and dials that indicate up to 100 kilowatt hours, and which may be reset to zero before beginning a new appliance test. The meter is provided with a cord and plug for connecting it to the appliance



outlet, while the appliance to be tested is plugged into an outlet on the back of the meter case. Two pointers and dials are provided, one with an 0 to 10 kw-hr. scale

and the other from 0 to 100 kw-hr. Available in 2 and 3-wire types. Duncan Electric Co., Lafayette, Ind.

Anti-Frictional Packing

A general, all-service plastic packing, "Super-Seal," with a new anti-frictional, dry-graphite lubrication that is resilient and has no tendency to harden or dry out. It is composed basically of extremely fine particles of a new alloy and a special high temperature binder covering each particle of alloy and each strand of long fibre asbestos, and containing flake graphite. This packing is available in spiral form. Crane Packing Co., Chicago, Ill.

Explosion Proof Switches

Types "A" and "R.B." safety switches for Class II, Groups F and G, hazardous locations such as atmospheres containing metal, coal, coke, grain or other similar dusts such as found in mines, grain and



textile mills, meat packing and woodworking industries. Switches are dust tight, water and weather-proof, and are furnished in heavy gauge steel boxes with gasketed covers, fastened by wing nuts. Available in 3-pole, no fuse, 30 to 200-amp. inclusive. The Trumbull Electric Mfg. Co., Plainville, Conn.

Multi-Breaker Load Center

The multi-breaker Load Center, hinge mounted in a cabinet, consists of one or more small circuit breakers grouped in a sealed moulded housing and each capable of interrupting 5000 amp, at 115 v., a.c. Approved as service equipment complete with the cabinet, the load centers are provided with solid mains up to 70 amp, and for 2-wire 115 v. or 3-wire 115/230 v., a.c. solid neutral service. Branch circuit breaker ratings are from 15 to 35 amp. Only line and branch load terminals are exposed inside of the metal cabinet, all other connections being sealed within the circuit breaker housings. Main terminals are protected by insulating covers removable for wiring during installation. The first arrangements available are for the

new meter sequence and will consist of combinations of single and double pole breakers suitable for residential requirements where the service is not above 70 amp. Breaker compactness is secured through design simplicity involving very few parts. The mechanism includes a conducting bar resting on a fulcrum, one end carrying the moving contact and the other engaging the bimetallic tripping ele-



ment. The bimetallic element is brazed to the branch circuit terminal. The stationary contact is common to all the multi-breaker poles within the molded housing, thus eliminating the usual bus connections. The bar is rocked on its fulcrum and actuated by the cam-shaped portion of the operating handle. A sturdy compression spring bearing on the bar serves to give unusually high contact pressure. The contacts are of a non-welding silver alloy. All terminals are of the solderless type. The molded housings accommodate up to four single breaker poles in the composite assembly. Pairs of breakers may be coupled for use as a two-pole breaker where desired. The common central contact eliminates many parts and joints and permits enclosing all but the line and branch circuit load terminals entirely within the sealed housings. It is claimed that heating is reduced, that the intended circuit arrangement is maintained by the sealed assembly and that the hazard of grounds and short circuits due to careless installation wiring is removed. The load center cabinet is equipped with a swing-out bracket upon which the breaker units are mounted, permitting an unobstructed interior for wiring. Westinghouse Elec. & Mfg. Co., Pittsburgh, Pa., jointly with Square D Co., Detroit, Mich.

Indirect Dome

An all white porcelain enameled inside and outside indirect dome for bowl silvered lamps with interior curvature designed to increase useful downward



illumination. An aperture in the dome acts as a reflector to increase the upward illumination. Equipped with porcelain enameled threaded hood for either pendant or outlet-box mounting, the wiring is



ALL-WAVE MULTICOUPLER ANTENNA SYSTEM

For multiple operation of from 2 to 20 radio sets—both for standard broadcast and short wave—in private homes and apartment houses, schools, hospitals, hotels. Gets rid of straggling aerials and supports; avoids property damage and installation hazards. Easily installed by the electrician; is inexpensive in first cost and involves *no upkeep expenses or replacements.*

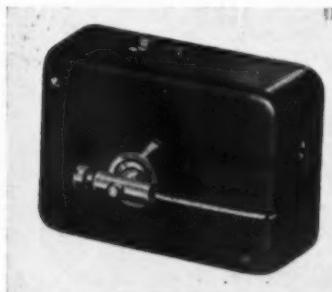
Illustration shows 3 different Multicoupler Outlets to choose from. Antenna Transformer (lower left) combines features of double antenna for short waves with accepted advantages of the "T" antenna for standard broadcast wavelengths. Free engineering service is given on plans and layouts for installation. Write first for general instructions folder describing the system.

ARROW ELECTRIC DIVISION
THE ARROW-HART & HEGEMAN ELECTRIC CO. HARTFORD, CONN.

simplified and the reflector is easily removed for servicing. The socket is adjusted vertically to permit lamp positioning. Made in two sizes, 200 watt and 300-500 watt. Graybar Electric Co., Inc., New York, N. Y.

Pilot Switch

The type ES-9 pilot switch is recommended for use where the lever-actuating force is extremely low. A pressure of one-half ounce at the end of the 1-in. lever is claimed to operate this switch for such applications as: electric counters, relays, alarm and signal systems, limit or safety stops, or other uses. Rated to



make and break $\frac{1}{2}$ amp., 110-V., a.c., or $\frac{1}{2}$ amp., 110-V., d.c., and weighing 1 oz., its bakelite case is $1\frac{1}{2}$ in. by $1\frac{1}{2}$ in. by $\frac{1}{4}$ in. Mounting holes are provided for bolting or screwing the switch to almost any surface, and in any desired position. An interior spring for lever return is optional, also the angles and directions of make and break. Production Instrument Co., Chicago, Ill.

Conduit Hanger

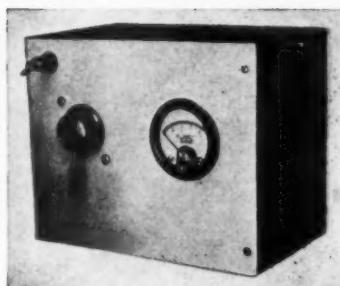
Rustproof cadmium plated malleable iron conduit hangers with set screw and freely turnable pipe support to permit running of conduits parallel to the beam or at



angles. Made in two sizes, No. 470 for $\frac{1}{2}$ -in., $\frac{3}{4}$ -in. or 1 in. conduit, and No. 471 for $1\frac{1}{4}$ -in. and $1\frac{1}{2}$ -in. conduit. May also be used as ground clamp, accommodating No. 8 to No. 4 wire. Fullman Mfg. Co., Latrobe, Pa.

Body Capacity Relay

A control device known as "Capacitrol," operating on the principle of body capacity, for the control of automatic doors, alarms, and other apparatus. It consists of a self-contained relay and equipment unit, and an antenna comprising from 5 to 50 ft. of rubber covered wire. When a person or car approaches within 3 ft. of the antenna, a relay in this device is claimed to operate. The Capacitrol unit may be placed at a con-



venient place, and the antenna extended as much as 50 ft. to the desired control point. The switching relay has a capacity of 100 watts non-inductive load, and is enclosed within the metal unit which measures $6\frac{1}{2}$ in. by 8 in. by $5\frac{1}{2}$ in. J. Thos. Rhamstine, Detroit, Mich.

General-Purpose Floodlights

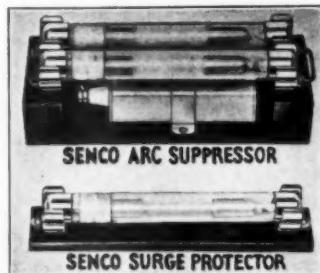
A line of Novalux "Handy" floodlights in junior and senior types, for 100 and 200-watt lamps, respectively. Recommended for use in homes, gardens, garages, filling stations, roadside stands, and other applications where diffused,



portable and adjustable light sources are needed. The glass front diameters are 8 in. and 10 in. for the two types, and may be had in clear or sand blasted heat-resisting, or in red, blue, green or amber types. The senior unit, model No. 2 AL-36-AAB1 is illustrated. General Electric Co., Schenectady, N. Y.

Arc and Surge Protection

Surge protectors are designed for use on 125, 250 and 500-volt d.c. circuits for the protection of coils and magnets from high self-induced surges, from lightning surges, and from static potentials. They are made in the Junior line with a peak load value of 10 amps., and in the Heavy Duty line with a peak load value of 100



amps. Arc suppressors are a combination of the surge protector tube and a condenser, and are made only in the heavy duty type. These devices are ordinarily placed in shunt with the coil and magnet. Sundt Engineering Co., Chicago, Ill.

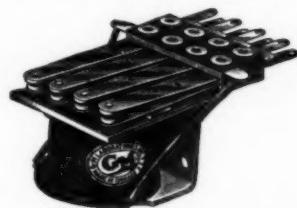
Lifting-Pulling Tool



A general utility tool in $\frac{1}{4}$ and 1-ton capacities for lifting or pulling vertically, horizontally or at any angle. The "CM" Puller is recommended for such jobs as tightening guy wires, general maintenance or construction service. Because of its gear reduction it is said to pull $\frac{1}{4}$ ton with 43 lbs. pressure applied to the collapsible ratchet handle. Operation is controlled by two buttons which permit adjustment of chain to a minimum distance between hooks of 9 in. The mechanism and automatic friction brake are fully enclosed with no exposed bearings or springs. Both models have collapsible handles for tool box storage. Chisholm-Moore Hoist Corp., Tonawanda, N. Y.

Relay

A.C. relay, known as Type A, can be supplied for operation on voltages from 2 to 230 volts, 25 to 60 cycles. It can be furnished with as many as four pairs of contacts and has a capacity of 10 amp. per contact. Extremely simple construction, low cost, and quiet operation are claimed.



The coil is wound on a moulded bakelite bobbin. G-M Laboratories, Inc., Chicago, Ill.

Thin-wall Cable Insulation

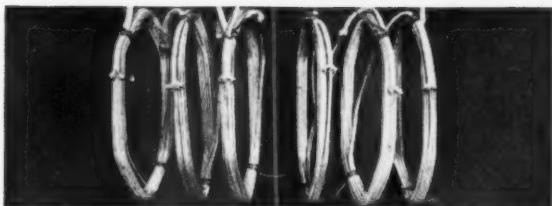
Thinwol, a new insulation development which makes possible the use of thinner dielectric material, resulting in reduced cable diameters and saving in space on multiconductor control cable installations. Claims of high dielectric strength and increased tensile strength make the thin-wall, space-saving features feasible. It is for use up to 220 volts a.c. or 450 volts d.c. In some cases, the manufacturer states the lead sheath on cable using this insulation, can be omitted because of the low moisture absorption of the insulating material. General Electric Co., Schenectady, N. Y.



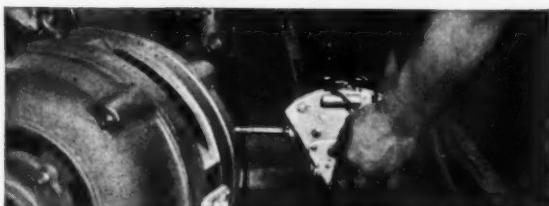
Sealed-in leads. Brought through an opening in the frame—and there anchored permanently with a special sealing compound. The roughest kind of service during installation or afterward cannot put strain on the field connections.



Special cuff insulation. Empire cloth inside of two special pre-formed fibrous sheets is inserted in the stator core slots. An ingenious method of folding makes a self-locking cuff which gives permanent protection to the coil when it leaves the stator slot.



Group-wound coils. A phase group winding complete in one piece of wire reduces stub connections and eliminates a source of mechanical failure. Lead connections from these phase windings are welded, not soldered or brazed—an innovation in winding construction that keeps motors out of the repair shop.



Every motor is given a thorough vibrometer test to make sure of proper dynamic balance. Eliminate vibration and you reduce to a minimum the wear on bearings. Sealed ball bearings and smooth running insure trouble-free service from F-M motors under the severest operating conditions.

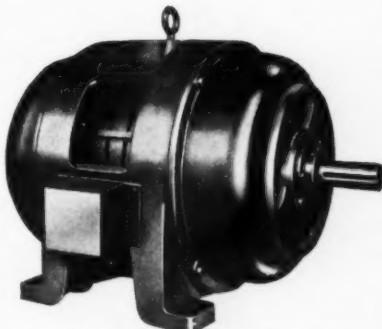
It's the little things that make a great motor

Certainly, a motor must come up to electrical specifications. But remember, a motor is an apparatus for converting electrical energy into *mechanical power*. And it's in the mechanical design and construction that you will find the biggest difference between one make of motor and another.

Fairbanks-Morse motors meet the most exacting electrical specifications. But with characteristic thoroughness, Fairbanks-Morse has achieved a posi-

tion of leadership in *mechanical design* and construction of motors.

We illustrate a few of the new, unusual methods which are employed to make Fairbanks-Morse "Type Q" motors give longer, trouble-free service. The complete story of this extra value in motors will be sent on request. Address Department L421, Fairbanks, Morse & Co., 900 South Wabash Avenue, Chicago, Ill. 34 branches at your service throughout the United States.



F-M "Type Q" Ball Bearing Motor

5764EA40.112

106
YEARS OF
PRECISION
MANUFACTURING

FAIRBANKS - MORSE
Motors

POWER, PUMPING AND WEIGHING EQUIPMENT





Save time and money when buying!

Use your copy
of the Buyers
Reference Number
of Electrical
Contracting to
find out

- What To Buy
- Where To Buy It
- Who Makes It



WOLVERINE SOLDERING LUGS Superior Quality

Superior in design and workmanship. Wolverine Soldering Lugs are made from highest grade seamless tubing drawn from pure electrolytic copper. They are superior because made so.

Sleeves always fit rated wire or cable. Square end design provides greater contact area, increasing current capacity. Solder never leaks out closed end. Have Underwriter's approval.

WOLVERINE TUBE CO.
1441 Central Ave., Detroit, Mich.
Stocks in All Large Cities

Trade Notes . . .

New Emerson Managers

Milton G. Miller has resigned as vice-president of The Emerson Electric Mfg. Co., St. Louis. Lester F. Blough has been elected vice-president in charge of motor sales and Oscar C. Schmitt vice-president in charge of fan sales and advertising.

The following appointments and changes in sales personnel were announced on August 1: R. E. Otto, from assistant manager to manager of motor sales; John Wright, from assistant manager to manager of fan sales; O. D. Metz, from manager of New York office to assistant manager of motor sales; Val J. Maurer to manager of New York office, and E. E. Harwood to motor sales staff at New York office.

To provide additional space for manufacturing operations, this company recently leased approximately 43,000 sq.ft. of floor space for warehouse purposes. The general offices of the company are to be moved two blocks east of their present location to a two-story building located on the southeast corner of Nineteenth and Washington Avenues, where they have leased approximately 34,000 sq.ft. of floor space. The space now devoted to office use will be absorbed by the manufacturing department.

Erie Malleable Iron Co., Erie, Pa., manufacturers of Kondu fittings and other malleable iron products, has announced that the receivership of the company was terminated on July 24. Enoch C. Filer is president; Charles G. Strickland, vice-president; J. H. Redhead, who has been associated with the malleable iron industry for many years, executive vice-president and general manager; and Ray H. Eisenlord, secretary-treasurer. Benjamin H. Scott is general sales manager, and Paul Urick, Kondu salesman.

G-E Supply Corp., Richmond, Va., formerly a branch of the Baltimore district, has been made the main house in a separate sales district. The new district comprises branches at Charlotte, N. C., and Raleigh, N. C. H. R. Weisiger has been appointed district manager and also will serve as sales manager of supplies.

The National Electric Products Corp., Pittsburgh, Pa., announces the acquisition of the business of Raymond Roth, Inc., New York, N. Y., manufacturers of Goeller connectors, Charmond terminal blocks and other devices. Sales and production detail will be handled by Raymond Roth.

Westinghouse Electric and Mfg. Co. announces that it will transfer the manufacture of small motors now produced at its Springfield, Mass., plant to Lima,

Ohio, due to the necessity for expanding the production facilities of its Springfield Works in merchandising lines, particularly refrigeration and air conditioning units. It is expected that motor production may be started in the new factory by the first of the year. The plant will be under the direction of R. F. Frenger, manager of the small motor division of the company.

J. M. McKibbin, who has been manager of industrial distribution for Westinghouse Electric & Mfg. Co., Pittsburgh, Pa., has been appointed manager of the company's sales promotion department. For several years Mr. McKibbin has been engaged in organizing a system of coordinating and directing sales of industrial equipment through dealer and distributor outlets.

Signal Electric Mfg. Co., Menominee, Mich., has started the construction of a 2-story addition to its plant that will be 79 ft. long and 56 ft. wide.

The Rawlplug Detroit Co. has been established at 14415 Myers Road, Detroit, Mich., by R. G. and T. C. Moeller to handle all Rawlplug products.

Harnischfeger Corp., Milwaukee, Wis., has appointed Indianapolis Machinery and Supply Co., Indianapolis, Ind., agent for its electric motors, hoists, and welders.

The Graybar Electric Co. has opened a new house at 1723 L St., Sacramento, California, as a branch of the San Francisco house.

Charles E. Johnson, formerly advertising-sales promotion manager of Curtis Lighting, Inc., has been appointed Chicago sales manager for the company. The early sales activities of Curtis Lighting of Canada were directed by Mr. Johnson who, after his return to the Chicago headquarters, took over the national sales promotion work.

The Art Metal Co., Cleveland, O., has increased its floor space approximately 50 per cent by moving the fabricating department, engineering department, offices and showroom to 1814 East 40th St. The present location will house the finishing and assembly departments and warehouse.

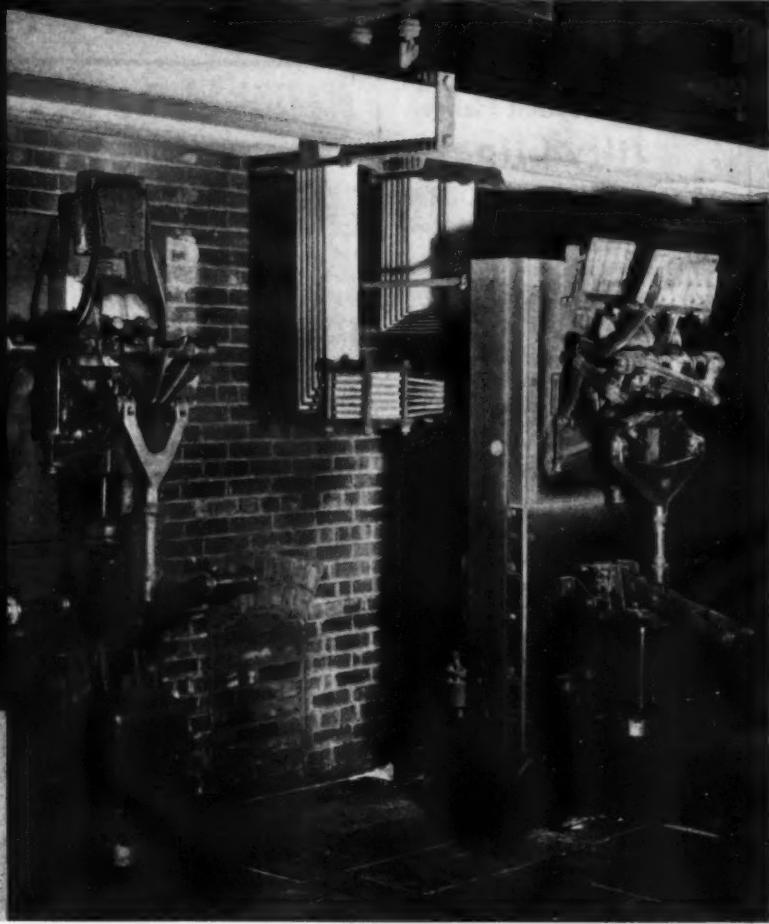
Ferranti Electric, Inc. has removed its executive and sales offices from 130 W. 42nd St., to larger quarters in the RCA Bldg., 30 Rockefeller Plaza, New York, N. Y. The company's factory also occupies larger quarters on West 53rd St., where new equipment is being installed.

Cutler-Hammer, Inc. has moved its Los Angeles, Calif. sales office to new quarters at 1331 Santa Fe Ave. A complete stock of C-H standardized motor control, safety switches and electrical specialties is carried at this office, which is in charge of W. G. Tapping.

Illinois Electric Porcelain Co., Macomb, Ill., has appointed Arthur G. Bernard sales manager.

Aluminum BUSSES are BETTER

Right: 550-volt, 10,000 amp. breaker, installed 1914. Joints are Aluminum to Aluminum to copper. In 22 years of service, no trouble has ever been experienced with these joints.



Any way you look at it . . .

. . . as a matter of expense,

. . . as a matter of convenience,

. . . as a matter of engineering efficiency.

Because it is at least 52% lighter, it can be handled more easily and often installed up on roof trusses . . . out of the way and with a minimum of supports.

Efficient taps, joints, and splices can be made by bolting, or by an easy welding technique.

Fittings are simple and inexpensive.

In addition to flat, angle and tubular bus, you may have Channeluminum which provides mechanical strength and rigidity for long unsupported runs, as well as thermal

and electrical efficiency appreciably better than in any other type bus for very heavy loads. Channeluminum plus flats, angles and tubes of Alcoa Aluminum meet every mechanical and electrical design requirement.

Even corrosion is beaten from the start with Aluminum bus, because Aluminum is inherently resistant to plating room fumes and sulphur-laden industrial atmosphere; it requires no special protection.

For full information concerning the economy and convenience of Alcoa Aluminum bus bar, write to: ALUMINUM COMPANY OF AMERICA, 2197 Gulf Building, Pittsburgh, Pennsylvania.



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Literature . . .

Wire and Cable: Publication No. 36-32 entitled "NEMA Rubber Insulated Building Wire and Cable Standards, 30 Per Cent Grade Compound" and No. 36-33 entitled "NEMA Rubber Insulated Building Wire and Cable Standards, Performance Grade Compound." These are companion publications to the one on National Electrical Code Grade Compound released a short time ago. These pamphlets contain the NEMA standards for wires or cables including the conductor, insulation, fibrous covering and lead sheath. Such items as physical properties and methods of test, insulation thicknesses, insulation test voltages, saturation of braid, etc., can be readily determined by referring to the standards in these publications. Price 25 cents each. National Electrical Manufacturers Association, New York, N. Y.

Threaded and No-Thread Fittings: The 224-page Unilet Catalogue No. 10 covers the malleable line of fittings for threaded or threadless rigid iron conduit, and also for electrical metallic tubing. A thorough catalogue number listing is given of wiring devices made by others which fit various switch, receptacle and miscellaneous fittings. Appleton Electric Co., Chicago, Ill.

Transformers: Ameriton distribution transformers are illustrated and described in a 40-page catalog No. 116. Sizes from $1\frac{1}{2}$ to 500 kva., and potentials from 240 to 73,000 volts are covered. A 24-page "Data Book" section contains a tabular arrangement of information concerning dimensions, weights, accessories, taps, etc. American Transformer Co., Newark, N. J.

Floodlights: Price chart and field layout for soft ball, football, tennis and baseball with new multiple floodlight mounting. Quadrangle Manufacturing Co., Chicago, Ill.

Plant Surveys: Bulletin No. 436, "The Graphic" contains twelve pages with illustrations, covering a thorough outline of "How to Make Plant Surveys with Graphic Instruments." The Esterline-Angus Co., Indianapolis, Ind.

Motor Data: Condensed data covering "Linc-Weld" motor dimensions in detail; speed ratings and current price lists are also contained in a 6-page folder. The Lincoln Electric Co., Cleveland, O.

Measuring Instruments: Leaflet No. 537 covers the Standco phase sequence indicator for checking the connections to motors, relays and instruments for phase sequence. Leaflet No. 6070 relates to the type "Z" measuring bridge for making resistance measurements

in the shop or field that range from 0.05 to 50,000 ohms. Herman H. Sticht Co., New York, N. Y.

Engines: A 48-page bulletin No. 305 describing the features of design in Troy-Engberg steam engines. Troy Engine and Machine Co., Troy, Penna.

Electronic Tube Ratings: Data sheets covering the ratings and characteristics of electronic tubes as employed in industrial applications. Types covered are: amplifier and oscillating; grid glow tubes and ignitrons; phototubes; rectifier tubes; and miscellaneous types. Special Products Dept., Westinghouse Lamp Co., Bloomfield, N. J.

Transformers: Bulletin No. 500 covers air cooled and oil cooled transformers from 1.5 kva. to 500 kva. in various voltages. Gardner Electric Manufacturing Co., Emeryville, Calif.

Oil Heating Equipment: A book entitled "Automatic Heating With Oil" with 58 illustrations, discusses oil heating problems in detail and also comparisons in equipment and operating costs. General Electric Co., Air Conditioning and Oil Heating Dept., Bloomfield, N. J.

Surge Protection: Folder No. 1436 describes Senco surge protectors and arc suppression products. Explanations of characteristics, operation, ratings, and special applications are accompanied by surge oscilloscopes. Sundt Engineering Co., Chicago, Ill.

Lighting Equipment: A 44-page "Datalog" giving lighting data and description of complete line. Holophane Co., Inc., New York, N. Y.

Switches and Controls: A revised loose-leaf "100th Anniversary" catalog of Colt-Noark switches, industrial control equipment, fuses and accessories. An eighteen-page section gives comparative catalog numbers of similar products made by other manufacturers. Arranged in five major sections segregating safety switches, industrial controls, meter service and entrance switches, fuses, and cast iron service and fuse boxes. Colt Patent Fire Arms Mfg. Co., Hartford, Conn.

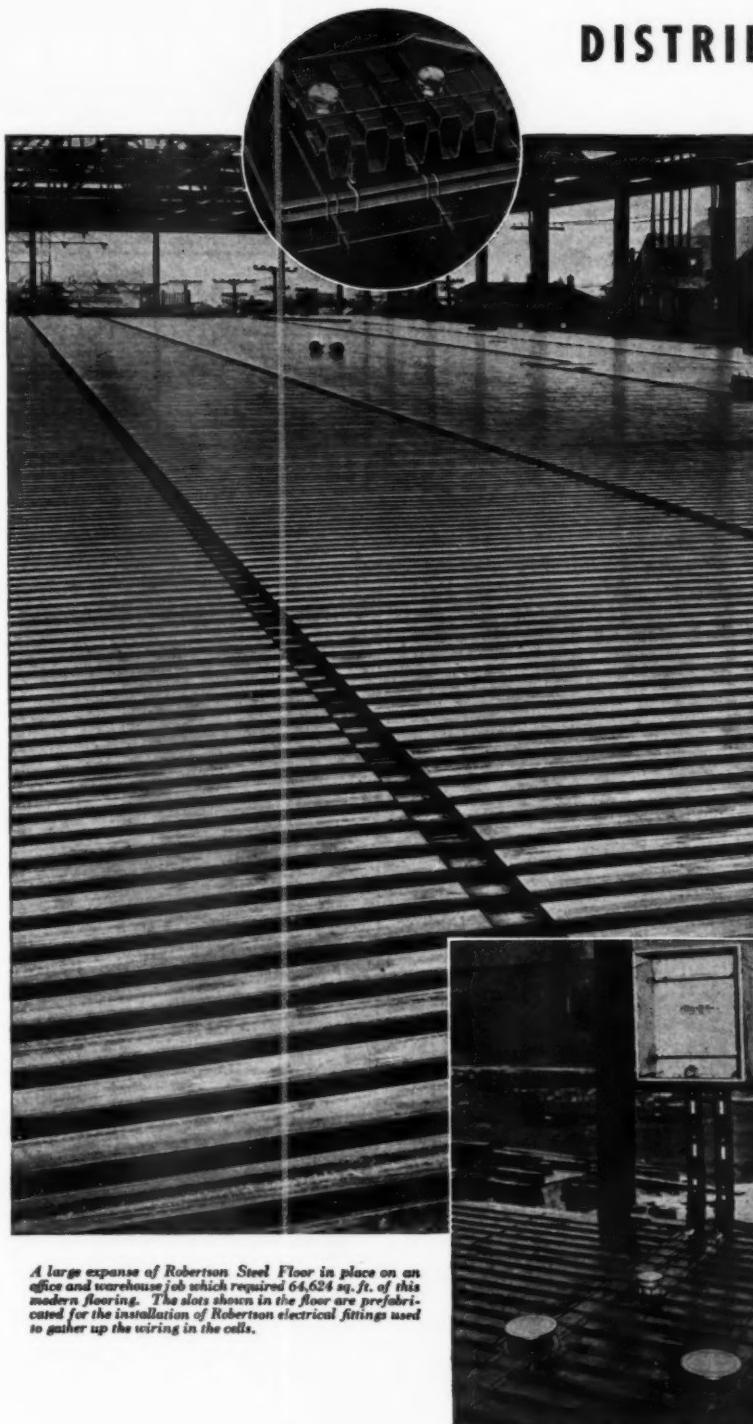
Motor Controls: Bulletin Index C announces several new a.c. and d.c. manual and automatic motor controls. Ward Leonard Electric Co., Mt. Vernon, N. Y.

Classified Advertising

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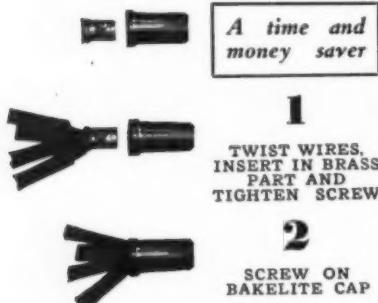
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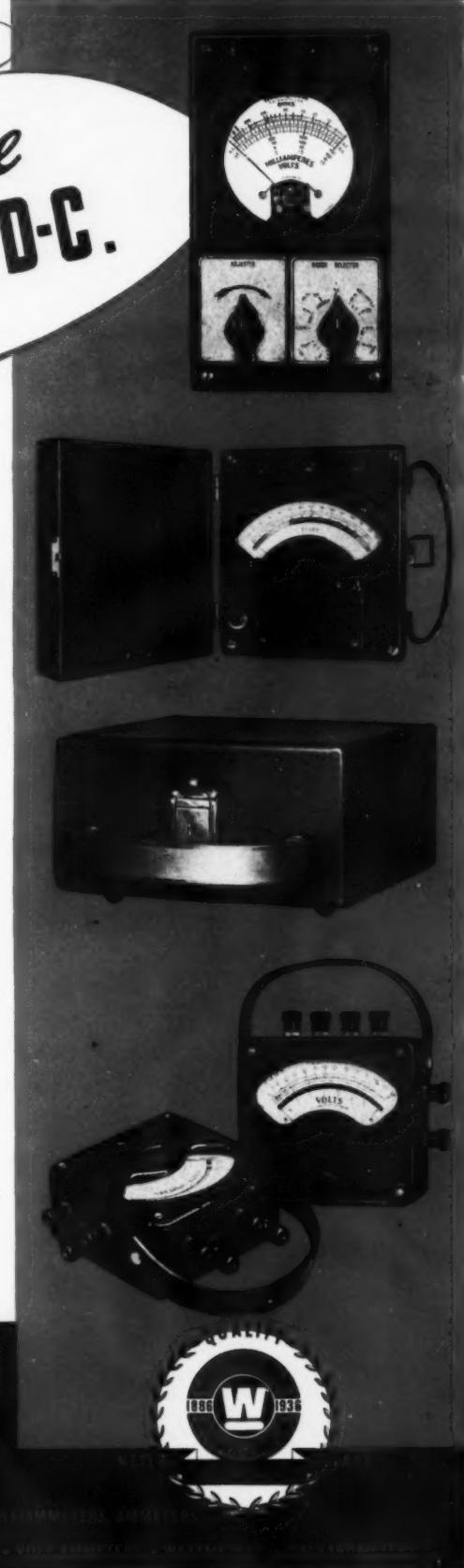
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